WORRALL

United States
Department of
Agriculture

Forest Service

**Forest
Pest
Management**

Washington, DC

Forest Insect and Disease Conditions in the United States 1988

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July 1989

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Technical Coordinators

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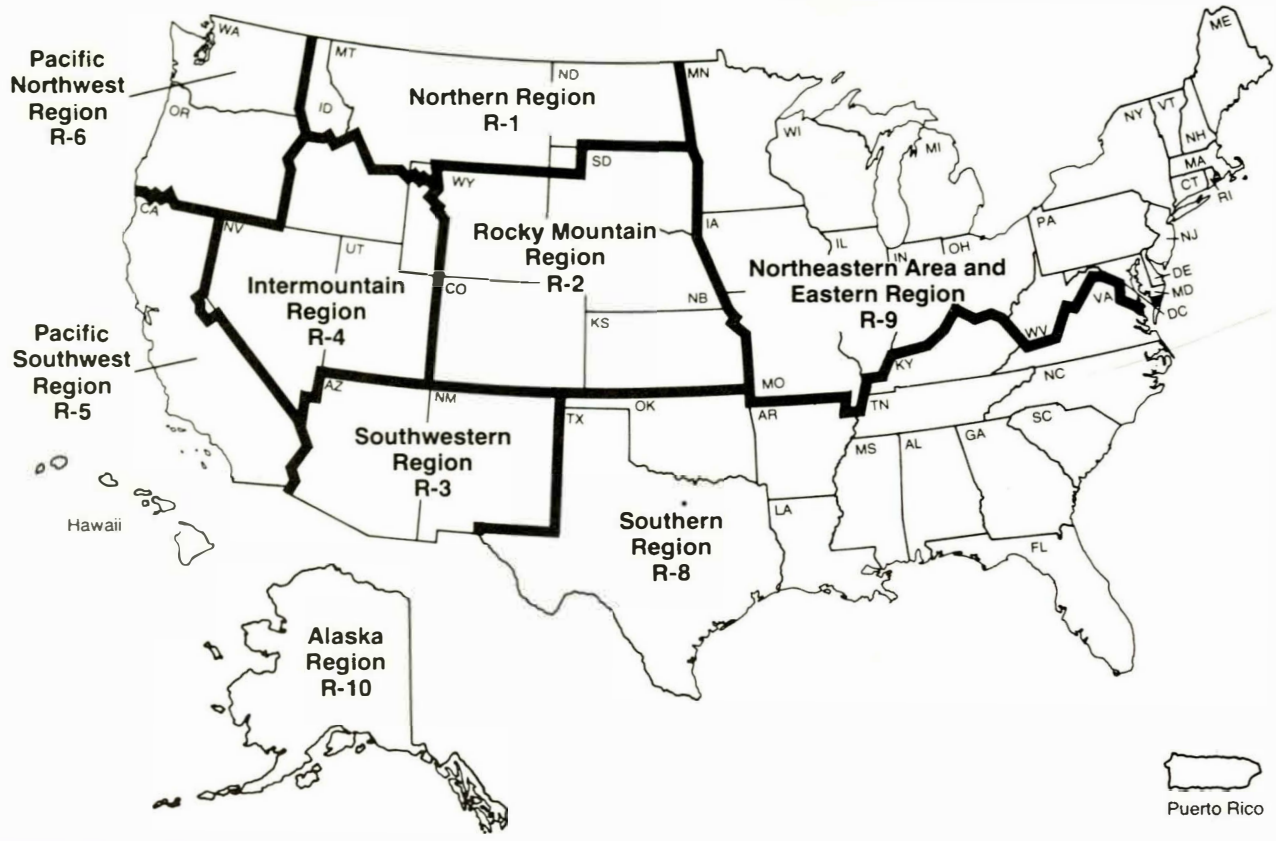
USDA Forest Service Regions and Area



Additional copies of this report are available from the Forest Service, Forest Pest Management, P.O. Box 96090, Washington, DC 20090-6090

Cover: Dogwood anthracnose on flowering dogwood.

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Introduction

The 1988 report provides an overview of forest insect and disease conditions in the United States.

The report is a three-part publication summarizing the current status of major insect and disease pests in the United States. Part I is a condition summation of five major insects and several significant diseases. In Part II, detailed information about pest conditions on all landownerships in the Forest Service Regions is arranged numerically by Region (see map on page ii). The Northern Region (Region 1) is first, and the Alaska Region (Region 10) is last. Each Region has two sections, a section on insects followed by a section on diseases. Part III is an index of common and scientific names of insects and disease-causing organisms.

Forest Pest Management offices nationwide completed the necessary information for lands of all ownerships.

This is the 38th year that Forest Pest Management, U.S. Department of Agriculture, Forest Service has published this report. Much of the report is based on special aerial or ground surveys. These surveys record short-term changes in pest activity, and they supplement the tree mortality information gathered in periodic forest resource inventory surveys done by the Forest Service.

We appreciate the assistance of all State, Federal, and private cooperators who provided information for this report.

For further information about conditions in a particular State, contact the responsible Forest Pest Management staff at the following addresses:

Northern Region (R-1)
Federal Building
P.O. Box 7669
Missoula, MT 59807

Rocky Mountain Region (R-2)
P.O. Box 25127
Lakewood, CO 80225

Southwestern Region (R-3)
Federal Building
517 Gold Avenue, S.W.
Albuquerque, NM 87102

Intermountain Region (R-4)
Federal Building
324 25th Street
Ogden, UT 84401

Pacific Southwest Region (R-5)
630 Sansome Street
San Francisco, CA 94111

Pacific Northwest Region (R-6)
P.O. Box 3623
Portland, OR 97208

Southern Region (R-8)
1720 Peachtree Road, N.W.
Atlanta, GA 30367

Eastern Region (R-9) and
Northeastern Area
370 Reed Road
Broomall, PA 19008

Alaska Region (R-10)
201 E. 9th Avenue
Suite 201
Anchorage, AK 95501

Part 1 National Summary

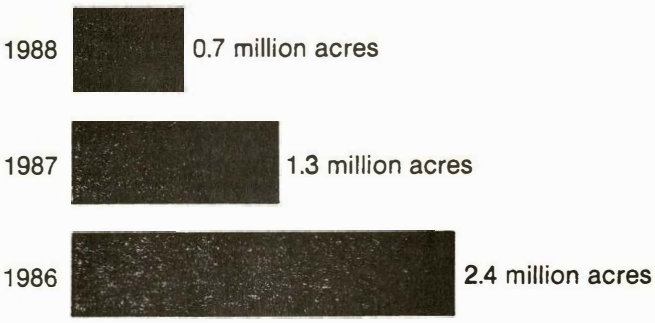
GYPSY MOTH

In 1988, the gypsy moth (*Lymantria dispar*) defoliated 719,00 acres in the generally infested area of the Eastern United States. This is a decrease of 610,000 acres from 1987 and is the fewest number of acres defoliated in any year since 1979.

Once again, Pennsylvania experienced the most defoliation of any State, 312,000 acres. However, this number reflects a drastic reduction from the 880,000 acres defoliated in 1987.

Widespread gypsy moth population collapses were noted in Massachusetts, New Jersey, New York, and Pennsylvania. Michigan, New Hampshire, Vermont, Virginia, and West Virginia were the only States that reported increases in acres defoliated in 1988. Increases were especially large in Virginia and West Virginia, 282% and 474% respectively.

Acres Defoliated by Gypsy Moth



1988 Gypsy Moth Generally Infested Area

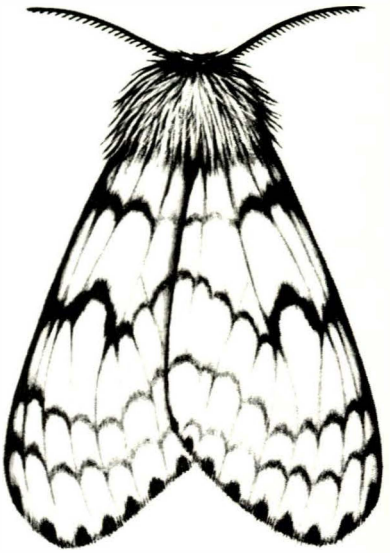
The gypsy moth continued its geographical spread. The entire lower peninsula of Michigan is now included in the generally infested area. North Carolina was also added to the list of States that have general gypsy moth infestations. In North Carolina, all of Currituck County and the northern portion of Dare County are under quarantine.

Three large isolated infestations outside of the generally infested area were of special concern in the United States: one in Oregon, one in North Carolina, and one in Virginia.

In Oregon, the Lane County infestation, that once covered 227,000 acres, may have been successfully eradicated. No treatment was carried out in the area in 1988, and the area is being closely monitored with pheromone traps.

Acres of Aerially Detected Defoliation

State	1987	1988
Connecticut	65,400	1,600
Delaware	2,500	800
Maine	600	100
Maryland	76,000	58,500
Massachusetts	28,700	0
Michigan	39,400	70,400
New Hampshire	300	1,000
New Jersey	95,100	7,400
New York	55,200	15,700
Pennsylvania	880,300	312,100
Rhode Island	5,100	700
Vermont	0	700
Virginia	67,700	191,000
Washington, D.C.	12	0
West Virginia	12,600	59,300
Total	**1,328,912**	**709,300**

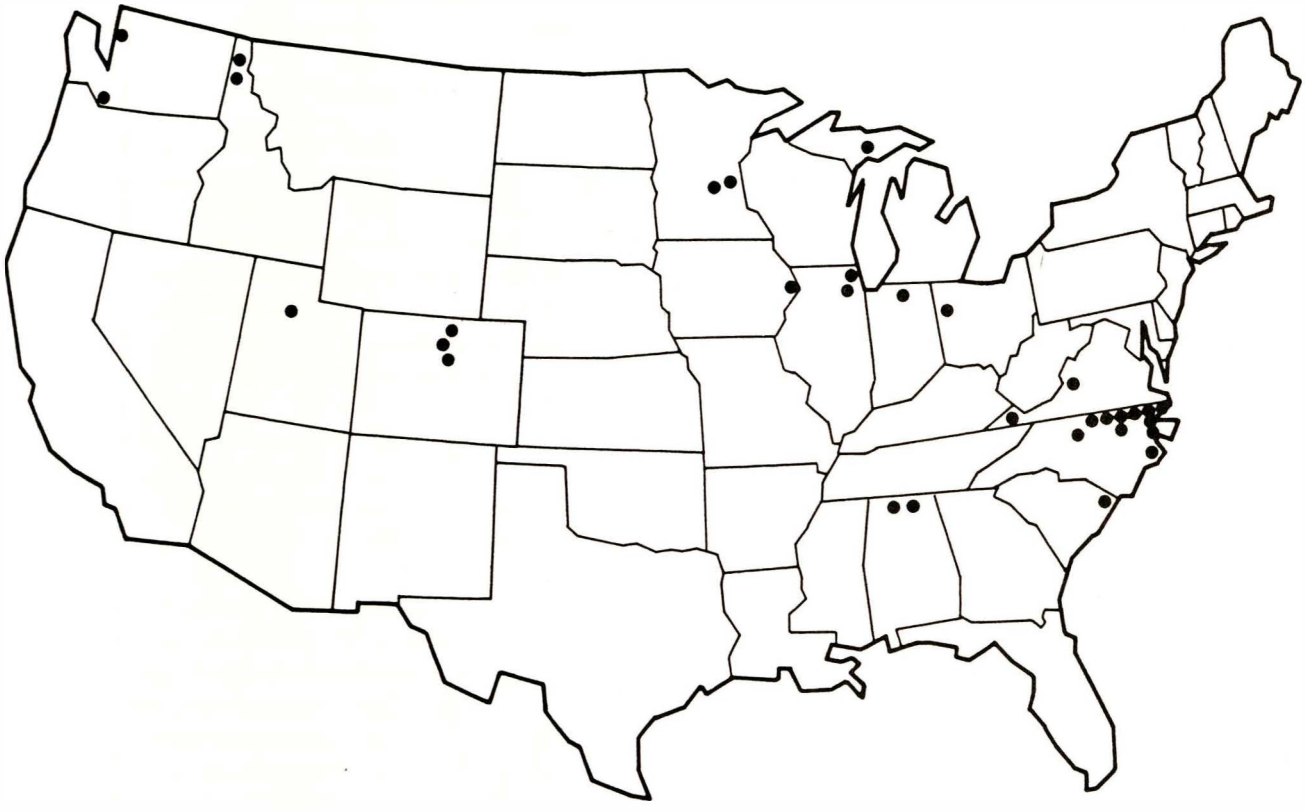


1988 Gypsy Moth Defoliation

The isolated infestation that was discovered in Clay County, North Carolina, in 1987 was treated again in 1988. Only 12 moths were trapped in 1988, none from within the 9,000 acre treatment area.

In Virginia, the extensive isolated infestation in Giles County was treated for the first time in 1988. Outside the 12,500 acre treated area, 571 male moths were trapped indicating unsuccessful eradication of the infestation.

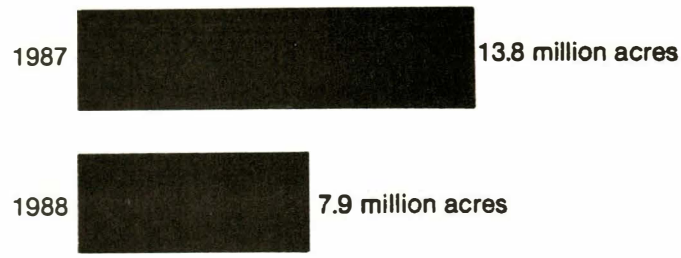
1988 Counties With Gypsy Moth Eradication



Southern Pine Beetle

Although the 1983 to 1986 southern pine beetle (*Dendroctonus frontalis*) epidemic continued to decline in the western Gulf states, populations increased in the Appalachian mountains and upper Piedmont. In the south, multiple tree spot infestations increased from about 23,500 to about 30,300. The number of "outbreak counties" (counties with one or more multiple tree spots per 1,000 acres of host type) increased from 83 to 94. However, affected acreage decreased by almost 6 million acres.

1988 Southern Pine Beetle Outbreak Acres



Acres In Outbreak†

State	1987	1988
Alabama	6,034,000	4,762,400
Arizona	774,000	0
Georgia	183,000	1,057,400
Florida	0	0
Kentucky	0	0
Louisiana	376,000	17,000
Mississippi	1,626,000	715,100
North Carolina	555,000	497,000
Oklahoma	1,000	0
South Carolina	2,904,000	609,100
Tennessee	440,000	278,100
Texas	475,000	0
Virginia	428,000	0
Total	13,796,000	7,936,100

†Acres of outbreak are acres of host type having one or more multiple-tree spots per 1,000 acres.

For the third year, losses declined in Texas. In Louisiana, acres affected decreased by about 359,000. "Outbreak counties" were not reported in either state, despite a moderate, late, summer increase in the number of multiple tree spot infestations detected.

In the eastern section of the South, losses to southern pine beetle were severe. Late season populations reached high levels in western North Carolina and North Georgia. The heaviest activity occurred in the Appalachian Mountains, with levels of activity decreasing from the foothills to the upper Piedmont. Losses in the lower Piedmont were relatively light. Coastal plain populations were negligible.

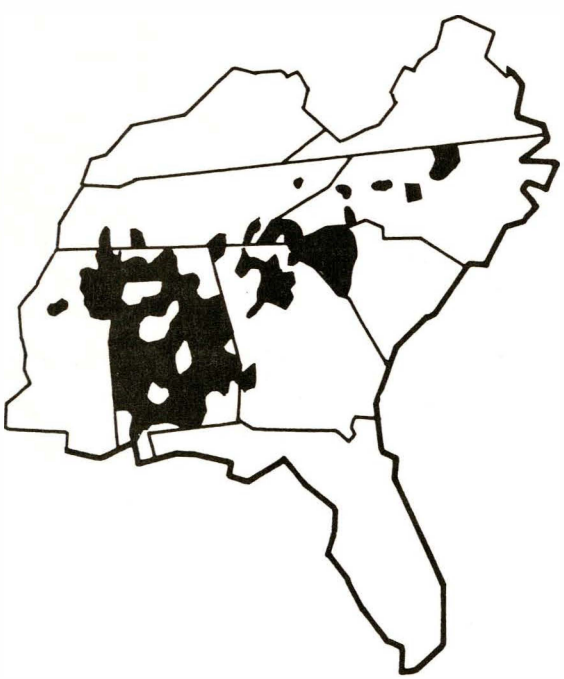
Southern pine beetles generally restrict their activity to southern pines, but in parts of the Appalachians the beetles attacked white pine. This is a condition characterisitc of severe outbreaks.

A large number of multiple tree spots were recorded in Mississippi after an extended period with high temperatures and low rainfall that lasted until mid-summer. Mississippi reported 10 "outbreak counties," and 9 of them were in the northeast section of the state. Alabama had 41 "outbreak counties." Most of the activity in Alabama was concentrated in the north and central parts of the state.

Southern Pine Beetle Outbreak Counties

Alabama:	Autauga, Bibb, Blount, Bullock, Butler, Choctaw, Clarke Clay Cleburne, Colbert, Conecuh, Coosa, Crenshaw, Cullman, Dallas, Elmore, Fayette, Franklin, Greene, Hale, Lamar, Lauderdale, Lawrence, Lee, Limestone, Lowndes, Macon, Marengo, Marion, Marshall, Monroe, Montgomery, Morgan, Perry, Pickens, Randolph, Russell, St. Clair, Tallapoosa, Tuscaloosa, Wilcox
Georgia:	Barrow, Chattahoochee, Dawson, Forsyth, Fulton, Gilmer, Gordon, Gwinett, Habersham, Hall, Jackson, Lumpkin, Murry, Rabun, Stewart, Walton
Mississippi:	Alcorn, Chickasaw, Clay, Grenada, Itawamba, Lee, Monroe, Pontotoc, Union, Prentiss
North Carolina:	Caldwell, Cherokee, Cleveland, Davie, Durham, Graham, Granville, Macon, Orange, Person, Randolph
South Carolina:	Abbeville, Anderson, Greenville, Greenwood, Laurens, McCormick, Oconee, Pickens, Spartanburg
Tennessee:	Bradley, Hamm, Hardiman, Marion, McMinn, McNairy, Wayne

1988 Southern Pine Beetle Outbreak Counties



Spruce Budworm

Spruce budworm (*Choristoneura fumiferana*) populations are collapsing toward endemic, innocuous levels. Nationwide, only 265,000 acres of defoliation were detected.

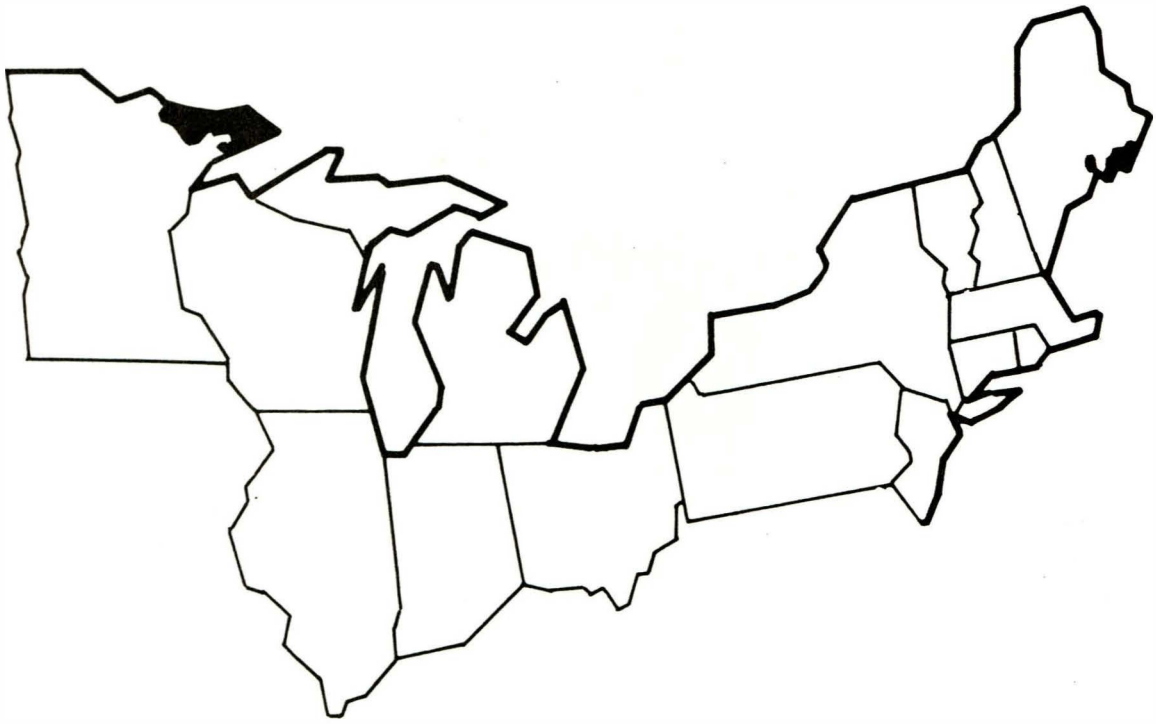
High spruce budworm populations were recorded in northern Minnesota where 200,000 of these acres of defoliation were mapped. This was the only area of significant defoliation in the United States.

Essentially, this marks the end of a spruce budworm outbreak that began in the mid-1970's in the United States and peaked in 1978.

Acres Of Aerially Detected Defoliation

State	1987	1988
Maine	250,000	65,000
Michigan	0	0
Minnesota	430,000	200,000
New Hampshire	0	0
New York	0	0
Vermont	0	0
Wisconsin	0	0
Total	680,000	265,000

1988 Spruce Budworm Defoliation



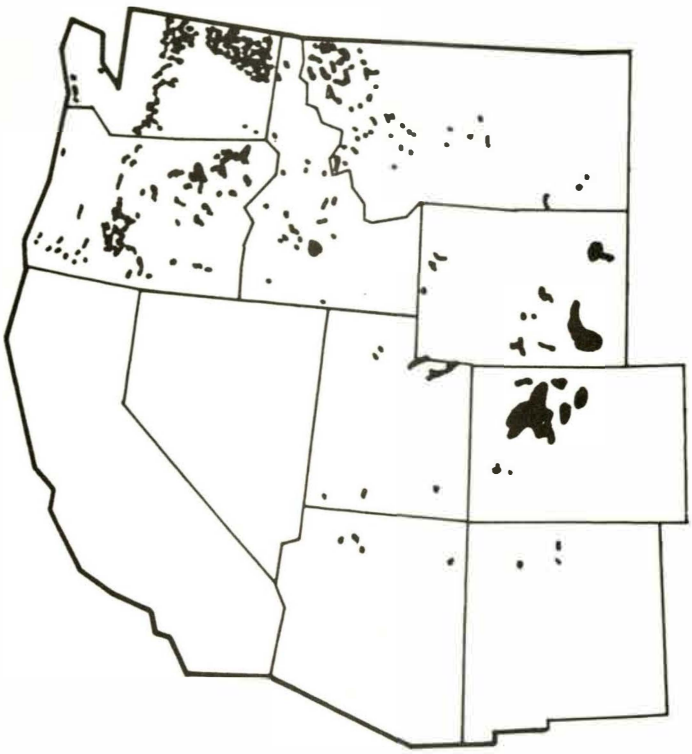
Mountain Pine Beetle

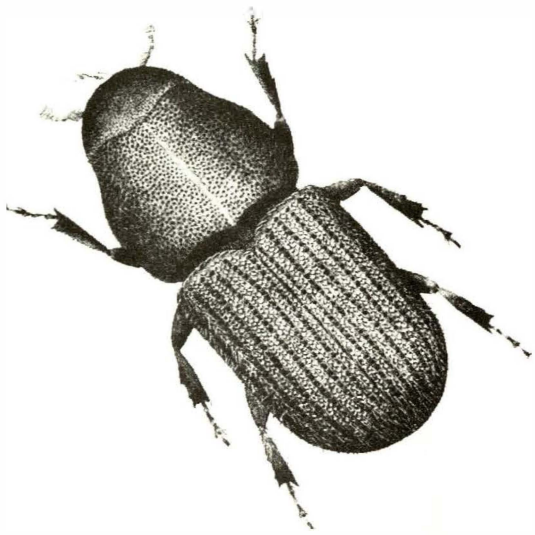
Mountain pine beetle (*Dendroctonus ponderosae*) populations generally decreased in 1988. The number of acres affected by this insect dropped slightly from a little over 2.4 million acres in 1987 to approximately 2.2 million acres in 1988. This is well below the yearly average of 3.5 million acres established during the first seven years of this decade. Washington was the only state that experienced a significant increase in beetle activity over 1987.

State	1987 Acres Affected	1988 Acres Affected	1988 Volume† Killed	1988 Number Of Trees Killed
Arizona	0	600	22	620
California	20,000	0	0	0
Colorado	2,500	13,000	1,300	82,500
Idaho	48,061	42,300	1,100	64,500
Montana	694,380	546,700	49,600	2,479,700
New Mexico	4,790	1,000	68	1,400
Oregon	1,400,000	1,311,400	42,700	2,879,200
South Dakota	2,340	2,600	23	7,100
Utah	97,400	12,500	400	21,000
Washington	158,000	220,300	4,700	224,600
Wyoming	14,700	55,600	1,200	88,900
Total	**2,442,171**	**2,206,000**	**101,113**	**5,849,520**

†Volume in thousand cubic feet of timber

1988 Mountain Pine Beetle Outbreak





Western Spruce Budworm

From a record 13.2 million acres of defoliation in 1986, the total number of Western spruce budworm (*Choristoneura occidentalis*) defoliated acres declined by another 1.9 million acres in 1988. The decrease in defoliated acreage was especially prominent in Idaho, from 2.5 million defoliated acres in 1986 to 61,000 acres in 1988.

1988 Western Spruce Budworm Defoliation

Acres Of Aerially Detected Defoliation

State	1987	1988
Arizona	15,500	5,800
California	0	0
Colorado	833,000	427,000
Idaho	898,200	61,000
Montana	1,802,000	2,064,000
New Mexico	250,400	477,700
Oregon	3,700,000	2,740,400
Utah	37,700	0
Washington	400,000	231,600
Wyoming	16,300	55,800
Total	7,953,125	6,063,300

Overview of Disease Conditions

Several diseases continued to severely damage eastern forests. One, dogwood anthracnose, was of particular concern because of its rapid spread, and because its ultimate distribution and severity remained uncertain. Other unknowns included specific identity of the causal fungus and an understanding of why the disease has become so damaging. This disease caused severe dogwood mortality in urban areas and forests in 13 eastern states. (fig. 1) Although individual urban dogwood trees can be treated, prevention or suppression of dogwood anthracnose on forest sites remained doubtful. For this reason, there was concern that the flowering dogwood may not survive in some areas. Surveys continued in order to better define the incidence and distribution of the disease.

Like dogwood anthracnose, factors that contributed to damaging levels in the 1970's of Scleroderris canker in the Northeast and pitch canker in the South were not well understood. Both Scleroderris canker and pitch canker, subsequently, declined in severity in the Northeast and South respectively as a result of natural causes, and Scleroderris canker incidence and severity continued to decline in Maine, New York, and Vermont.

Conversely, in five southern states, reports of pitch canker damage increased in slash and shortleaf pine plantations. Pitch canker damage was also reported in several urban areas and pine tree seed orchards. In the West, seven counties in California, including three locations in southern California, reported incidence of pitch canker.

Pitch canker was eradicated San Luis Obispo, San Mateo, and Santa Clara counties in California.

Some states reported symptoms of air pollution. In New England, high ozone levels caused symptoms, such as broad leaf foliage flecking, stippling, conifer needle tipburn, and chlorotic mottle. These symptoms were reported on cherry, ash, white pine, and several shrubs. In North Carolina, a number of similar air pollution foliage symptoms were noted in 13 western counties. Symptoms of ozone effects were reported in the light to moderate range in central and southern California.

Fusiform rust continued as the most damaging disease to southern pines, particularly loblolly and slash pine. About 30 percent of susceptible host type (17 million acres) of natural and planted pines in 11 states had at least 10 percent of trees infected with potentially lethal cankers (cankers on or within 12 inches of the stem).

The current status of fusiform rust is listed in Table 1. These estimates were based on data obtained from the Forest Inventory and Analysis (FIA) units at the Forest Service Southern and Southeastern Forest Experiment Stations. FIA units update State surveys about every 8 years. FIA-based fusiform rust data were reported for the first time for Alabama, Arkansas, Louisiana, Mississippi, Oklahoma, and Texas. Data for Florida have been updated since last years report.

The dollar loss due to fusiform rust was estimated for Florida, Georgia, North Carolina, South Carolina, and Virginia at about $35 million, down slightly from last year's report. Dollar losses by state were based on the most recent FIA data, growth projections, and economic models.

Estimates, by state, of volume in thousands of cubic feet (MCF) lost to fusiform rust on all landownerships is listed in Table 2.

Root diseases were particularly damaging in California, Idaho, Montana, Oregon, and Washington and this caused concern for two reasons: (1) root diseases are difficult to control, and (2) root diseases may intensify from one rotation to the next causing tree mortality, butt rot, and growth loss. Root diseases also predispose trees to insect attack and windthrow. Annual volume losses in Oregon and Washington, alone, have been estimated at over 170 million cubic feet. The Southwest annually has lost an estimated 4.8 million cubic feet to root diseases.

The dwarf mistletoes infected western conifers on about 22 million acres of timberland. In Colorado and Wyoming, the disease caused mortality and growth loss equal to 10 million cubic feet. In Arizona and New Mexico, losses in wood production could exceed 25 million cubic feet; in California, 100 million cubic feet; and in Oregon, 131 million cubic feet. However, most volume loss from reduced growth and mortality was caused by 6 of 16 species of dwarf mistletoes that infect lodgepole pine, Douglas-fir, western larch,

true firs, western hemlock, and ponderosa pine. As stand management intensifies, losses decline. In contrast to the root diseases, dwarf mistletoes were relatively easy to control during management operations.

Stem decay fungi destroyed enormous volumes of wood. Historically a problem, in mature and overmature forests, many infections now originate in managed stands of thin-barked species that are susceptible to wounding during stand entries, such as fir.

White pine blister rust caused extensive tree mortality throughout much of the range of western white and sugar pines in California, Idaho, Montana, Oregon, and Washington. Efforts were intensified in California to identify rust-resistant pines and to curtail planting susceptible sugar pine. Annually, in Idaho and northwestern Montana, increased acreage has been successfully re-planted with rust-resistant stock. Annual losses of western white and sugar pines in Oregon and Washington have been estimated at about 15 million cubic feet. White pine blister rust was a problem only in the northeastern area of Iowa, but there was a significant increase in severity. In Maine, the disease occurred statewide. In Vermont, there were few new infections and no change in mortality rates.

Interacting biotic and abiotic factors caused tree declines of several tree species that included ash, birch, oak, maple, spruce, and fir.

- In New York, Vermont, Indiana, Minnesota, Ohio, Pennsylvania, Iowa, and Missouri, dieback and mortality of green and white ash were attributed to a mycoplasms-like organism called ash yellows.

- Dieback of white birch stabilized in Maine and increased in Vermont.

- Six Northeastern states and much of the South reported drought- and insect-related oak decline. Oak decline mortality was reported on ridges with shallow, rocky soils and following gypsy moth defoliation.

- Reports of sugar maple decline continued from Maine, New York, and Vermont. Drought, insect defoliation, and site factors were implicated.

- Six Northeastern states, Maine, Massachusetts, New Hamphsire, New York, Vermont, and West Virginia, again reported spruce-fir decline. Interacting insects, diseases, and weather factors stressed forests and were considered part of the decline complex. There was continued concern about the possible role air pollution played in the decline complex.

The following are other diseases of note:

- Cedar decline continued as one of the most important disease problems in Alaska.

- Conifer foliage diseases were more prevalent in many areas of the West, except for the Pacific Northwest and Northern Regions.

- Camandra blister rust continued as the most serious disease of lodgepole pine on the Wind River Ranger District, Shoshone National Forest, Wyoming.

- Several foliage and canker diseases caused branch dieback and tree mortality in Plains state windbreaks.

- The central Texas oak wilt epidemic continued and has killed thousands of trees each year in rural and urban areas.

- There was little change in incidence or severity of beech bark disease and Dutch elm disease.

- Oak wilt caused considerable damage in the Lake States, particularly in Minnesota.

Table 1. Status of Fusiform Rust In The East: Acres With Greater Than 10 Percent Infection[1]

(Acres in Thousands)

State (Year Surveyed)[2]	National Forests	Other Federal	State[3]	Private[4]	Total Acres	Total Host Acres[5]	Percent Of Total Host Acres Infected
Alabama (82)	47	24	17	2533	2621	7710	34
Arkansas (88)	0	0	0	307	307	3840	8
Florida (87)	29	10	31	1263	1332	5790	23
Georgia (82)	37	140	36	5084	5297	9290	57
Louisiana (84)	82	6	17	1680	1785	5950	30
Mississippi (87)	213	12	61	1732	2019	6310	32
N.Carolina (84)	4	9	26	1101	1139	3670	31
Oklahoma (86)	0	0	0	23[6]	23	380	6
S.Carolina (86)	86	58	63	1633	1841	4600	40
Texas (86)	23	0	0	601	625	5230	12
Virginia (86)	0	0	0.8	70	71	1760	4
TOTAL	**521**	**259**	**252**	**16027**	**17060**	**54530**	**31**

[1]Estimates of acres affected for Alabama, Louisiana, Mississippi, Oklahoma, and Texas are reported for the first time using FIA data. These more accurate estimates supersede previous estimates for these States. Therefore, changes in acres affected from those in past reports reflect changes in estimation procedures as opposed to changes in acres actually affected.

[2]Year of most recent FIA survey.

[3]Includes county and municipal ownerships.

[4]Includes industrial and non-industrial ownerships.

[5]Includes infected and non-infected host acres.

[6]All industrial ownerships.

1988 Dogwood Anthracnose in Eastern United States

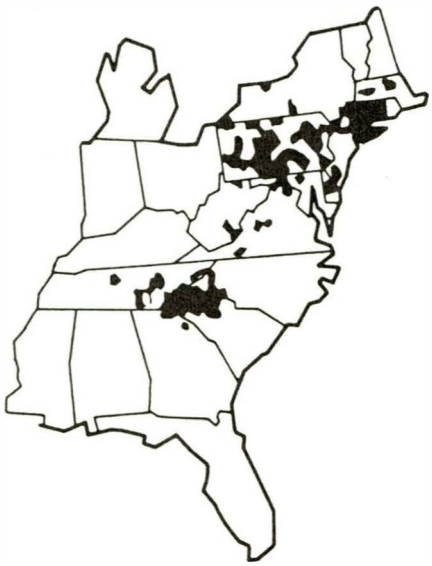


Table 2. Estimated Loss of Volume in Thousands of Cubic Feet (MCF)

State	MCF
Alabama	11,800
Arkansas	1,500
Florida	1,400
Georgia	14,200
Louisiana	6,200
Mississippi	12,100
North Carolina	2,600
South Carolina	2,400
Texas	1,300
Virginia	400
TOTAL	**53,900**

Part 2 Regional Conditions

Northern Region Insects

Prepared by Jed Dewey

Insect	Host	Location	Remarks
Balsam woolly adelgid *Adelges piceae*	Grand fir, Subalpine fir	Idaho	Additional areas infested by the adelgid continue to be found. A new infestation was detected on the Selway Ranger District, Nez Perce National Forest. Some mortality was observed in subalpine fir. Infestations persist on the Palouse Ranger District, Clearwater National Forest, and on private land southeast of Pierce, Idaho.
Boxelder defoliator *Archips negundanus*	Boxelder	Montana	Reported as a new state record in 1987, this defoliator persisted at about the same intensity in and around Missoula, Montana, in 1988.
Cranberry girdler moth *Chrysoteuchia topiaria*	Douglas-fir, Western larch	Idaho	At the Coeur d'Alene Forest Service Nursery, almost 2,300 adult moths were trapped during their summer pheromone trap monitoring program. Two ground applications of diazinon and one application of chlorpyrifos were made between July 22 and August 24. Excellent control was obtained.
California tortoiseshell *Nymphalis californica*	Snowbrush, Serviceberry	Idaho, Montana	Tortoiseshell-caused defoliation was once again conspicuous in brush fields of *Ceonothus* sp. in northern Idaho. Populations were highest on the Idaho Panhandle National Forests between St. Maries and Sandpoint.
Douglas-fir beetle *Dendroctonus pseudotsugae*	Douglas-fir	Idaho, Montana	Drought conditions contributed to a marked increase in Douglas-fir beetle activity throughout the Region. In Montana, about 2,500 acres were infested, killing approximately 4,300 trees. In northern Idaho, more than 25,100 acres were infested killing 72,000 trees.
Douglas-fir tussock moth *Orgyia pseudotsugata*	Douglas-fir, Spruce, True firs	Idaho, Montana	No tussock moth-defoliated stands were detected in the Region. Pheromone trap catches remained very low in northern Idaho and Montana. However, defoliation was noted on individual ornamental trees in Missoula, Polson, Big Fork, and Kalispell in Montana and Coeur d'Alene, Kellogg, and St. Maries in Idaho. Defoliation of ornamental trees in urban areas often preceded outbreaks in the forests.

Insect	Host	Location	Remarks
Fir engraver *Scolytus ventralis*	Grand fir, Subalpine fir	Idaho	Triggered by extreme drought conditions, infestation expanded to over 33,600 acres compared to about 2,200 acres in 1987. Approximately 43,000 trees were killed. Most of the infestation occurred on private land located within the Idaho Panhandle National Forests reporting area.
Forest tent caterpillar *Malacosoma disstria*	Hardwoods	Idaho, Montana	The tent caterpillar outbreak in Region 1 persisted. Populations declined significantly in much of western Montana but increased at several locations in northern Idaho and northwestern Montana in and around Glacier National Park.
Gouty pitch midge *Cecidomyia piniinopis*	Ponderosa pine	Idaho	Little change was noticed from the 1987 situation. Damage was most notable in young ponderosa pine stands of northern Idaho.
Gypsy moth *Lymantria dispar*	Conifers, Hardwoods	Idaho, Montana, Wyoming	In Idaho, following fairly high pheromone trap catches in 1987, a subsequent intensive egg mass survey was conducted in the spring of 1988. Egg masses were found in Sandpoint and Coeur d'Alene, Idaho, in the spring of 1988. Infestation centers were treated from the ground using acephate insecticide. Subsequent pheromone trap surveys caught 85 moths in Coeur d'Alene and 325 moths in Sandpoint indicating that reproducing populations were still present in these areas. A cooperative pheromone trap survey in Montana among the Department of State Lands, State Department of Agriculture, Animal and Plant Health Inspection Service, and the U.S. Department of Agriculture, Forest Service resulted in single trap catches near Helena and Bozeman, Montana.
Larch casebearer *Coleophora laricella*	Western larch	Idaho, Montana	Larch casebearer populations remained low with no significant areas of defoliation detected.
Lodgepole terminal weevil *Pissodes terminalis*	Lodgepole pine	Idaho, Montana	Terminal weevil damage persisted in lodgepole pine plantations throughout the Region. Highest damage levels occurred on the Beaverhead and Flathead National Forests of Montana. A damage survey of a lodgepole pine plantation on the Flathead Indian Reservation, Montana, showed that 10 percent of the trees were infested.

Insect	Host	Location	Remarks
Mountain pine beetle *Dendroctonus ponderosae*	Lodgepole pine, Other pines	Idaho, Montana	Tree mortality of all hosts continued to decline throughout most of the Region. A few areas remained where populations continued to increase. In Montana, on all ownerships tree mortality declined to about 547,000 acres from approximately 695,000 acres in 1987. In northern Idaho about 12,500 acres were infested. Approximately 22,000 trees were killed. Compared to 1987, when about 14,000 acres were infested and approximately 41,000 trees were killed. The decline in tree mortality was be partially attributed to the number of consecutive years infestations occurred. In many areas, susceptible stands have been depleted by the beetle and/or timber harvesting.
Pine engraver beetle *Ips pini*	Lodgepole pine, Ponderosa pine	Idaho, Montana	In northern Idaho, outbreak acreages more than doubled to 3,700 acres in 1988 from 1,500 acres in 1987. About 12,000 trees were killed in northern Idaho. In Montana, approximately 75 acres in the Flathead Indian Reservation were infested. The 1988 drought conditions contributed to the proliferation of this pest.
Spruce beetle *Dendroctonus rufipennis*	Engelmann spruce	Idaho, Montana	Spruce beetle-caused tree mortality remained low. Only 27 acres of infestation were detected, all of which were on western Montana forests.
Western balsam bark beetle *Dryocetes confusus*	Subalpine fir	Idaho, Montana	Infestation of this pest was at a very low level. Only 21 acres of scattered tree mortality, mostly in western Montana, were detected during the 1988 aerial survey.
Western pine beetle *Dendroctonus brevicomis*	Ponderosa pine	Idaho	Throughout much of northern Idaho and western Montana, ground surveys have shown increased tree mortality of ponderosa pine stands. It is extremely difficult to differentiate between pine engraver beetle- and western pine beetle-caused mortality in ponderosa pine from aerial surveys. The aerial survey estimate of 1,500 acres of infestation was probably conservative.

Insect	Host	Location	Remarks
Western pine shoot borer *Eucosma sonomana*	Ponderosa pine, Lodgepole pine	Idaho, Montana	The western pine shoot borer continued to be a pest of young ponderosa pine stands throughout much of the Region. Control efforts with a synthetic pheromone as a mating disruptant continued at selected high-value plantations.
Western spruce budworm *Choristoneura occidentalis*	Douglas-fir, oo Engelmann spruce, True firs, Western larch	Idaho, Montana, Wyoming	Budworm-caused defoliation increased to over 2 million acres. The dramatic increase in defoliation was attributed mainly to the Helena National Forest where defoliation increased to more than a million acres from 660,000 acres in 1987. On the Nez Perce National Forest in northern Idaho the level of infestation expanded to almost 19,000 acres from about 14,000 acres in 1987.

Northern Region Diseases

Prepared by Jim Byler

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Atropellis canker *Atropellis piniphila*	Lodgepole pine	Idaho, Montana	Atropellis canker was common in poles and saw timber. It caused defect, topkill, and tree mortality.
Comandra blister rust *Cronartium comandrae*	Lodgepole pine, Ponderosa pine	Idaho, Montana	Comandra rust was found on Montana lodgepole and ponderosa pines in many parts of Idaho and Montana. It was especially severe in Montana forests east of the Continental Divide.
Diplodia blight *Sphaeropsis sapinea* (=*Diplodia pinea*)	Ponderosa pine	Idaho, Montana	This pathogen has been associated with branch dieback at many locations in Idaho and Montana. Damage was especially severe in Montana near Flathead Lake where tree mortality occurred during the past three years.
Dwarf mistletoes			Estimated levels of infestation and economic losses resulting from dwarf mistletoes remained unchanged from 1987. Dwarf mistletoes were present on about 3 million acres and continued to be one of the major causes of forest damage.
Arceuthobium americanum	Lodgepole pine	Idaho, Montana	Lodgepole pine dwarf mistletoe infested almost 2 million acres (28 percent) of the lodgepole type and caused over 18 million cubic feet of growth loss.
Arceuthobium douglasii	Douglas-fir	Idaho, Montana	Douglas-fir dwarf mistletoe infested about 0.6 million acres (13 percent) and caused over 13 million cubic feet of loss.
Arceuthobium laricis	Western larch	Idaho, Montana	Western larch dwarf mistletoe occured on about 0.8 million acres (38 percent) and caused over 15 million cubic feet of loss. Regeneration cutting using clearcutting, seed tree cutting, and shelterwood cutting were used to manage these pathogens. Interest in uneven-aged management raised new questions about dwarf mistletoe management.

Northern Region--Status of diseases in Montana, northern Idaho, North Dakota, and National Park Service lands in northwestern Wyoming

Disease	Host	Location	Remarks
Stem decays *Phellinus pini* *Echinodontium tinctorium*	Various conifers	Idaho, Montana	Stem decay fungi destroy large volumes of wood. Two of particular concern are *Phellinus pini* which is most damaging to lodgepole pine and western larch, and *Echinodontium tinctorium* which causes major losses in grand fir and hemlock stands.
Western gall rust *Endocronartium harknessii*	Lodgepole pine, Ponderosa pine, Scotch pine	Idaho, Montana, North Dakota	Common on hard pines, this disease causes stem infections resulting in locally severe tree mortality and top kill.
White pine blister rust *Cronartium ribicola*	Western white pine, Whitebark pine	Idaho, northwestern Montana	White pine blister rust caused extensive tree mortality throughout the range of western white pine. Although this disease precluded management of susceptible western white pine on high-hazard sites, increased acreage has been successfully regenerated each year with rust-resistant white pine. Whitebark pine, an important food source for grizzly bears, was severely damaged in and around Glacier National Park. This damage was minor in the Yellowstone Park ecosystem.
Root Diseases			
Annosus root disease *Heterobasidion annosum*	Douglas-fir, Grand fir, Ponderosa pine, Subalpine fir, Western hemlock	Idaho, western Montana	Root diseases are still among the most damaging pests in the Region. Annually, root diseases cause tree mortality on about 2 million acres in northern Idaho and over 1 million acres in Montana (approximately 15 percent of the Region's commercial forest land). Incidence is greatest in northern Idaho and west of the Continental Divide in Montana.
Armillaria root disease *Armillaria* spp.	Douglas-fir, Other conifers	Idaho, Montana	
Black stain root disease *Ceratocystis wageneri* [*Verticicladiella wageneri*]	Douglas-fir, Lodgepole pine, Ponderosa pine	Idaho, Montana	Armillaria root disease and laminated root rot continue to be the most damaging diseases. Annosus root disease was found to be especially common in ponderosa pine stands on the Flathead Indian Reservation and in Douglas-fir and true fir stands on the Clearwater and Nez Perce National Forests.
Laminated root rot *Phellinus weirii*	Douglas-fir, Grand fir, Western redcedar, Other conifers	Idaho, Montana	

Disease	Host	Location	Remarks
Schweinitzii butt rot *Phaeolus schweinitzii*	Douglas-fir, Other conifers	Idaho, Montana	
Foliage Diseases			
Dothistroma needle blight *Mycosphaerella pini* *[Dothistroma septospora (=Dothistroma pini)]*	Austrian pine, Lodgepole pine, Ponderosa pine, Western white pine	Idaho Montana	Though commonly found throughout the Region, foliage disease levels were low. Dothistroma needle blight occurs regularly in the Lochsa River drainage on the Clearwater National Forest. Elytroderma was chronic at certain locations, including the Bitterroot Valley, the Flathead Indian Reservation, and around Flathead Lake in Montana. Other foliage diseases were noted but no outbreaks were reported.
Douglas-fir needle cast *Rhabdocline pseudotsugae* *Rhabdocline weirii*	Douglas-fir	Idaho, Montana	
Elytroderma disease *Elytroderma deformans*	Ponderosa pine	Idaho, Montana	
Larch needle blight *Hypodermella laricis*	Western larch	Idaho, Montana	
Larch needle cast *Meria laricis*	Western larch	Idaho, Montana	
Swiss needle cast *Phaeocryptopus gaeumannii*	Douglas-fir	Idaho, Montana	
Vascular Wilts and Declines			
Dutch elm disease *Ceratocystis ulmi*	American elm, Siberian elm	Montana, North Dakota	Dutch elm disease continued to spread in urban areas in North Dakota and Montana.

Disease	Host	Location	Remarks
Nursery Diseases			
Fusarium root rot *Fusarium* spp.	Douglas-fir, other conifers	Idaho, Montana	The usual nursery diseases were found in Federal, State and private nurseries, but no serious outbreaks were reported. Fusarium root disease was the most serious problem, and was common in containerized seedlings in Montana and Idaho. Evaluations of control measures are in progress. For the past two years evaluations have also been conducted at the Coeur d'Alene Nusery to determine efficacy of dazomet to control several bareroot seedling root diseases.
Gray mold *Botrytis cinerea*	Engelmann spruce, lodgepole pine, western larch	Idaho Montana	
Phoma blight *Phoma* spp.	Most conifers	Idaho	
Sirococcus tip blight *Sirococcus strobilinus*	Engelmann spruce, ponderosa pine	Idaho, Montana	

Rocky Mountain Region Insects

Prepared by Ken Lister

Insect	Host	Location	Remarks
Bagworms *Thyridopteryx ephemeraeformis*	Rocky Mountain juniper	Kansas	Very little damage was reported except in areas where no control measures were implemented in 1988.
Cankerworms *Alsophila pometaria* *Paleacrita vernata*	Elm, Hackberry, Honeylocust	Kansas, South Dakota	In contrast to severe damage and large populations in 1987, damage may have been less in 1988 than in any of the last ten years.
Dioryctria moths *Dioryctria ponderosae* *Dioryctria tumicolella*	Ponderosa pine, Scot's pine	Nebraska, Colorado, South Dakota	This pest continued to be a serious problem of pines in central and western Nebraska. Light damage was reported in Colorado. Populations remained high state-wide in South Dakota.
Douglas-fir beetle *Dendroctonus pseudotsugae*	Douglas-fir	Colorado, Wyoming	Infestation continued in areas heavily defoliated by western spruce budworm in the recent past. The beetle was also observed attacking trees which were not defoliated.
Douglas-fir tussock moth *Orgyia pseudotsugata*	Douglas-fir, Engelmann spruce	Colorado	Detection surveys trapped moths in the South Platte drainage. Numbers caught did not indicate outbreak conditions. New infestations occurred on a few trees in Ft. Collins and on one tree in Vail.
Elm leaf beetle *Pyrrhalta luteola*	Siberian elm, American elm	Kansas, Nebraska, South Dakota	Severe damage was reported in western Kansas but normal damage was reported in eastern Kansas. The second generation caused the heaviest foliar damage. Extensive defoliation occurred throughout Nebraska and South Dakota.
European pine sawfly *Neodiprion sertifer*	Pine	Kansas	This pest appears to be moving west, although damage reports were still small in number.
Forest tent caterpillar *Malacosoma disstria*	Hardwoods	South Dakota	An outbreak caused 50 to 75 percent defoliation to most of the hardwoods on several thousand acres in the northeast corner of the State. A virus was found in large numbers of dead caterpillars; pupal parasites were also found.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

Insect	Host	Location	Remarks
Gypsy moth *Lymantria dispar*	Hardwoods	Colorado, Wyoming, South Dakota	Detection surveys were conducted throughout the 5-state Region. In Colorado 149 male moths were trapped in Ft. Collins, 2 male moths in Boulder, and 43 male moths in Lakewood. One moth was caught on the Shoshone National Forest just east of Yellowstone National Park.
Honeysuckle aphid *Hyadaphis tataricae*	Honeysuckle	South Dakota	Damage was found throughout the state. However, new aphid damage seemed less than previous years.
Jack pine budworm *Choristoneura pinus*	Jack pine	Nebraska	No visible defoliation was observed in a stand that previously had experienced heavy defoliation in the Bessy District of the Nebraska National Forest.
Juniper sawfly *Monoctenus fulvus*	Juniper	Kansas	Populations were very low.
Large aspen tortrix *Choristoneura conflictana*	Aspen	Colorado	Populations have subsided to endemic levels.
Lilac borer *Podosesia syringae*	Green ash, Lilac	Nebraska, South Dakota	This pest continued to be a problem in young trees and lilac.
Mountain pine beetle *Dendroctonus ponderosae*	Limber pine, Lodgepole pine, Ponderosa pine	Colorado, South Dakota, Wyoming	Populations were scattered and static in the Black Hills. Approximately 7,100 trees were successfully attacked on about 2,500 acres. In Wyoming, populations increased in the Laramie Peaks area of the Medicine Bow National Forest, and 23,000 trees on 12,500 acres were attacked. The epidemic outbreak on the Uncompahgre plateau in Colorado continued in ponderosa pine. In lodgepole pine, populations continued to decrease. In the Blue River area, low population levels were static.
Pine budworm *Choristoneura lambertiana*	Ponderosa pine, Limber pine	Colorado	Defoliation levels declined from earlier years in southwestern Colorado.
Pine engraver beetles *Ips* spp.	Ponderosa pine, Jack pine	Nebraska, South Dakota	These pests were found near thinning operations and in highly stressed trees.

Insect	Host	Location	Remarks
Pine needle sheathminer *Zelleria haimbachi*	Ponderosa pine	Nebraska	Population numbers were high at Hastings and moderate at Horning State Farm near Plattsmouth.
Pine tip moths *Rhyacionia bushnelli* *Rhyacionia frustrana*	Austrian pine, Ponderosa pine, Scots pine, Pinyon pine	Colorado, Nebraska, Kansas	Damage continued to ornamental pinyon pine in the metro areas of Colorado. Pine tip moths continued to be a problem on young pine throughout Nebraska. In Kansas, damage was very light compared to previous years. A few Christmas tree growers reported some damage, but no windbreak damage was reported.
Spider mites *Oligonychus ununquis*	Juniper	Kansas	Damage was reported earlier in the year than normal, in May. Hot, dry conditions probably contributed to the increase in population.
Spruce beetle *Dendroctonus rufipennis*	Engelmann spruce	Colorado, Wyoming	Populations were at endemic levels in scattered windthrown spruce and logging slash.
Terminal weevils *Pissodes terminalis* *Pissodes engelmanni*	Lodgepole pine, Engelmann spruce, Blue spruce	Colorado, Wyoming	Light scattered damage continued in lodgepole pine regeneration near Buffalo, Wyoming. Some terminal damage occurred in ornamental and native spruce near Evergreen, Colorado.
Walnut caterpillar *Datana integerrima*	Walnut	Kansas	Damage was minor. Individual trees were defoliated.
Western balsam bark beetle *Dryocetes confusus*	Subalpine fir	Colorado	Small, widely scattered groups of dying trees were observed. Slight increases occurred associated with armillaria root disease centers.
Western spruce budworm *Choristoneura occidentalis*	Douglas-fir, Engelmann spruce Subalpine fir, White fir	Colorado, Wyoming	Populations continued to decline in the chronic infestation areas in Colorado and Wyoming. An estimated 427,000 acres were lightly defoliated in Colorado and 13,500 in Wyoming. A new 15,000 acre area of infestation was discovered in southeast Colorado in the Dolores and San Miguel River drainages.

Rocky Mountain Region Diseases

Prepared by David Johnson

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Comandra blister rust *Cronartium comandrae*	Lodgepole pine	Wyoming, Colorado	Continued as the most serious disease of lodgepole pine on the Wind River Ranger District, Shoshone National Forest, where more than half of the mature trees were infected and 85 percent of infected trees had dead tops. Comandra rust was present but was not a management problem in northern Colorado.
Dwarf mistletoes *Arceuthobium americanum*	Lodgepole pine	Colorado, Wyoming	Dwarf mistletoes remained the most important disease on Federal lands in the Region. This disease was found on approximately 518,000 acres in Colorado and 361,000 acres in Wyoming. The disease caused mortality and growth loss equal to approximately 10 million cubic feet. Presuppression surveys were conducted on 27,432 acres on four National Forests. Silvicultural control was conducted on 3,714 acres on seven National Forests.
Arceuthobium douglasii	Douglas-fir	Colorado	There were reports of many trees killed in recreational areas and homesites in the mountains west of Colorado Springs.
Arceuthobium vaginatum subsp. *cryptopodum*	Ponderosa pine	Colorado	Approximately 20 percent of the host type was infected. Annual losses amount to over 885,000 cubic feet.
Canker Diseases			
Thyronectria austro-americana	Honeylocust	Colorado, Kansas	This was a major disease problem in urban plantings along the Colorado Front Range and continued to be a problem in Kansas windbreaks.
Botryodiplodia spp.	Juniper	Kansas	This continued to be a problem in windbreaks.
Phomopsis or *Tubercularia* sp.	Russian olive	Kansas, South Dakota	This disease continued to cause serious decline and mortality in windbreaks in eastern Kansas.

Disease	Host	Location	Remarks
Botryodiplodia hypodermia	Siberian elm	Colorado, South Dakota	Cankers were associated with flagging and decline in eastern Colorado. Elm decline continued throughout South Dakota. Herbicide damage was suspected as a predisposing factor to infection by this fungus.
Botryosphaeria stevensii	Eastern redcedar, Rocky Mountain juniper	Nebraska, Kansas	This was a serious problem in scattered areas of eastern and central Nebraska and Kansas. Disease incidence in 14 windbreak plantings of Rocky Mountain juniper in Kansas ranged from 2 to 22 percent.
Cytospora spp.	Colorado blue spruce	Colorado	This was commonly found on samples from El Paso County.
Root Diseases			
Armillaria spp.	Subalpine fir, Engelmann spruce, Lodgepole pine	Colorado	This was the most common root disease in the State. The potential for damaging losses was unknown.
Foliage Diseases			
Anthracnose *Gnomonia leptostyla*	Walnut	Kansas	This was not a problem in 1988 because of dry weather.
Apiognomonia venata (=*Gnomonia platani*)	Sycamore	Kansas	Continued to be very severe in many areas of northeastern Kansas.
Ink spot *Ciborinia whetzelli* Marssonina blight *Marssonina populi*	Aspen	Colorado, South Dakota	These diseases were found throughout the aspen type which caused aesthetic concern. Fewer incidents were reported in 1988.
Diplodia blight *Sphaeropsis sapinea* (=*Diplodia pinea*)	Ponderosa pine, Austrian pine	Kansas, Nebraska, South Dakota	Branch dieback and tree mortality were common in windbreaks and urban plantings. This disease was becoming active again in the Black Hills.
Gymnosporangium juniperi-virginiae	Eastern redcedar	South Dakota	Galls on cedar were extremely heavy, especially in south and central areas of the state. Galls were so numerous on some trees that branches broke.

Disease	Host	Location	Remarks
Puccinia sparganioides	Green ash	South Dakota	Reports were more numerous than normal, but less than during the outbreak of 1987. Most trees were expected to recover.
Brown spot *Mycosphaerella dearnessii* (=*scirrhia acicola*)	Scotch pine	Kansas	Christmas tree growers reported very few incidents.
Needle casts *Lophodermella concolor* *Lophodermella montivaga*	Lodgepole pine	Colorado	There were noticeable symptoms on trees throughout the Sulphur Ranger District, Arapaho National Forest.
Phomopsis juniperovora *Cercospora sequoiae* *Kabatina juniperi*	Eastern redcedar, Rocky Mountain juniper	South Dakota, Nebraska	Continued to be a problem in windbreaks.
Dothistroma pini	Austrian pine	Nebraska	Continued to be a problem on young trees in scattered areas.
Vascular Wilts and Declines			
Dutch elm disease *Ceratocystis ulmi*	Elm species	Colorado, Nebraska, South Dakota	There was a decline in incidence in Colorado. However, this disease remained a top priority for control in Colorado's urban forests. In South Dakota, the disease continued to kill 6 to 10 percent of the American elms in communities without management programs.
Pine wood nematode *Bursaphelenchus xylophilus*	Scotch pine	Kansas	This disease was reported for the second year in Johnson County. Sanitation was recommended as the control measure.
Undetermined	Juniper	Kansas	There was a continual problem in windbreaks. Symptoms included tip dieback, branch mortality, or complete death of trees. The causal agent was still undetermined.
Undetermined	Green ash	Colorado	A few cases of declining ash were noted in urban areas. There was no evidence of mycoplasmas, although states to the east and west of Colorado reported decline.
Undetermined	Ponderosa pine	Colorado	A general recovery of pine from the mid-'80's was noted in the San Juan Basin in southwestern Colorado.

Disease	Host	Location	Remarks
Nursery Diseases			
Leaf shothole *Cylindrosporium* sp.	Black cherry	Nebraska	This disease was controlled with dodine.
Abiotic			
Chemical damage	Many tree species	Colorado	Improper use of herbicides and soil sterilants continued to damage and kill trees in the Front Range and eastern Colorado.
Drought, winter injury, other unknown agents	Ponderosa pine, Black walnut, Buffaloberry, Blue spruce, Russian-olive, Dogwood, Pear	South Dakota	Drought and abnormally high temperatures affected trees in many counties throughout the states.
Frost	Colorado blue spruce	Colorado	Late season frost damage was reported in eastern counties.
Hail damage	Engelmann spruce, Subalpine fir, Lodgepole pine	Colorado	Thirty to fifty acres of natural seedlings and saplings had branch wounds.
High water	Ponderosa pine	Colorado	Pockets of mortality were noted north of Mancos, Colorado.
Other			
Sprout dieback	Aspen	Colorado	Mortality of one- to several-year-old sprouts occurred infrequently after harvest of aspen stands. Preliminary observations indicated some association with wet sites, dry sites, snow breakage and herbivore damage.
Rodent feeding	Rocky Mountain juniper	South Dakota	Rodents girdled small branches and twigs in woody draws in Badlands National Park. Low moisture and high temperatures caused a lack of grasses and other forage normally utilized by rodents.

Southwestern Region Insects

Prepared by Terrance J. Rogers

Insect	Host	Location	Remarks
Douglas-fir beetle *Dendroctonus pseudosugae*	Douglas-fir	Arizona, New Mexico	Douglas-fir beetle activity decreased to 3,360 acres in 1988 from 5,020 acres in 1987. Individual and group killing of Douglas-fir trees occurred on the Apache-Sitgreaves National Forest and Fort Apache and Navajo Indian Reservations in Arizona and on the Carson and Santa Fe National Forests in New Mexico. Estimated volume loss regionwide was 197,500 cubic feet.
Large aspen tortrix *Choristoneura conflictana*	Aspen	Arizona, New Mexico	Infestations of large aspen tortrix decreased noticeably from 4,790 acres in 1987 to 1,555 acres in 1988. Estimated volume loss from mountain pine beetle-killed trees approximated 83,250 cubic feet. Losses occurred on the Grand Canyon National Park and Navajo Indian Reservation in Arizona and on the Carson and Santa Fe National Forests and Taos Pueblo Indian Reservation in New Mexico.
Pandora moth *Coloradia pandora*	Ponderosa Pine	Arizona	Pandora moth defoliation was not reported on the Grand Canyon National Park in 1988.
Pine engraver beetles *Ips* spp.	Ponderosa pine	Arizona, New Mexico	Several species of *Ips* caused approximately 4,985 acres of ponderosa pine mortality regionwide. Over half the mortality (2,925 acres) detected in 1988 occurred on the Lincoln National Forest in New Mexico. Smaller areas of engraver beetle-killed trees also occurred on the Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests in Arizona; on the Fort Apache, Navajo, and San Carlos Apache Indian Reservations in Arizona; and on the Carson, Cibola, and Santa Fe National Forests, and Santa Clara Indian Reservation in New Mexico. Volume losses approximated 612,150 cubic feet.

Insect	Host	Location	Remarks
Prescott scale *Matsucoccus vexillorum*	Ponderosa pine	Arizona	Prescott scale infestations caused minor amounts of twig and branch die back to seedlings, saplings, and pole-sized ponderosa pines on the Chevelon Ranger District, Apache-Sitgreaves National Forests.
Spruce aphids *Elatobium* sp.	Spruce	Arizona	This aphid caused approximately 100 acres of moderate to heavy defoliation on the Fort Apache Indian Reservation.
Spruce beetle *Dendroctonus rufipennis*	Englemann spruce	Arizona, New Mexico	Spruce beetle activity regionwide decreased significantly to 55 acres in 1988 from 1,220 acres in 1987. Spruce beetle-caused-tree mortality occurred on the Apache-Sitgreaves National Forests in Arizona and on the Carson National Forest in New Mexico. Volume loss in 1988 approximated 5,500 cubic feet.
True fir bark beetles *Scolytus* spp. Western balsam bark beetle *Dryocetes confusus*	True firs	Arizona, New Mexico	These bark beetles caused minor levels of tree mortality on the Apache-Sitgreaves, Coconino, Coronado, and Prescott National Forests in Arizona; on the Fort Apache and Navajo Indian Reservations in Arizona; on the Carson, Gila, Lincoln and Santa Fe National Forests in New Mexico; and on the Taos Pueblo Indian Reservation in New Mexico. Volume losses were estimated at 36,000 cubic feet.
Western pine beetle *Dendroctonus brevicomis*	Ponderosa pine	Arizona, New Mexico	Western pine beetle-killed trees increased substantially throughout the Region to 2,590 acres in l988 from 325 acres in 1987. Most of the tree mortality observed occurred on the Prescott and Tonto National Forests and Fort Apache Indian Reservation in Arizona and the Lincoln National Forest and Mescalero Apache Indian Reservation in New Mexico. Volume losses approximated 227,500 cubic feet.

Insect	Host	Location	Remarks
Western spruce budworm *Choristoneura occidentalis*	Douglas-fir, white fir	Arizona, New Mexico	Regionwide, this budworm defoliated approximately 483,389 acres of the mixed conifer forest spruce cover type. The largest areas of defoliation continued to occur on the Carson (185,660 acres) and Santa Fe (218,320 acres) National Forests in New Mexico. Smaller areas of defoliation occurred on the Apache-Sitgreaves (5,840 acres) National Forest and Navajo (2,450 acres) Indian Reservation in Arizona; on the Cibola (7,700 acres), Gila (1,640 acres), and Lincoln (11,830 acres) National Forests in New Mexico; and on the Jemez (3,000 acres), Jicarilla Apache (1,730 acres), Picuris (820 acres), and Santa Clara (3,160 acres) Indian Reservations in New Mexico. Light defoliation was also observed in the Kachina Peaks Wilderness on the Coconino National Forest. An additional 41,239 acres of state and private lands in New Mexico were also defoliated in 1988. Volume loss was estimated to be 3.4 million cubic feet.
White fir needleminer *Epinotia meritana*	White fir	Arizona	This pest continued to cause minor defoliation on the northern portion of the Kaibab National Forest for the second consecutive year. Approximately 1,675 acres were defoliated.

Southwestern Region Diseases

Prepared by Helen M. Maffei

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Aspen trunk rot *Phellinus tremulae*	Aspen	Arizona, New Mexico	*Phellinus tremulae* was responsible for the most common cull and defect in aspen. This white trunk rot, widespread throughout the host type, caused significant losses, especially in mature stands. Cull volumes may equal as much as 60 percent of the total volume.
Comandra blister rust *Cronartium comandrae*	Mondell pine, Ponderosa pine	Arizona	Comandra blister rust occurred in the Payson and Prescott areas on exotic Mondell and the native ponderosa pines. Damage was restricted to individual trees but may spread to nearby Christmas tree plantations.
Dwarf mistletoes *Arceuthobium* spp.	Douglas-fir, Engelmann spruce, Ponderosa pine	Arizona, New Mexico	Estimated infestation levels and economic losses resulting from dwarf mistletoes remained unchanged from 1987. Dwarf mistletoe infestation caused a significant decrease in yield on commercial and noncommercial forest lands. Approximately 46 percent (2.2 million acres) of the total commercial acreage (4.8 million acres) was infested. Losses in wood production may exceed 25 million cubic feet of commercial timber in Arizona and New Mexico. As a point of reference, estimated total volume from commercial conifers is approximately 202 million cubic feet.
Fir broom rust *Melampsorella caryophyllacearum*	True firs	Arizona, New Mexico	Fir broom rust was widely distributed in subalpine, corkbark, and white firs and caused occasional top breakage. The impact of the disease appeared to be unusually high on Sandia Peak, Cibola National Forest, New Mexico. There was wide-spread breakage associated with bole cankers. Infected trees experienced moderate mortality.

Southwestern Region--Status of diseases in Arizona and New Mexico.

Disease	Host	Location	Remarks
Red ring rot *Phellinus pini*	Douglas-fir, Ponderosa pine, Spruce, True firs	Arizona, New Mexico	*Phellinus pini* is indigenous to mature and overmature stands of pine and mixed conifers. Scattered in distribution, losses and damage were minimal in most stands. It has also been found on immature pine and mixed conifers in suppressed conditions.
Rust-red stringy rot *Echinodontium tinctorium*	Spruce	Arizona	This fungus was scattered in mature and overmature stands of mixed conifers and caused insignificant losses.
Spruce broom rust *Chrysomyxa arctostaphyli*	Spruce	Arizona, New Mexico	Spruce broom rust was scattered throughout the host type but was of little commercial significance.
Stem cankers *Encoelia pruinosa* (= *cenangium singulare*) *Ceratocystis fimbriata* *Cryptosphaeria populina* *Hypoxylon mammatum*	Aspen	Arizona, New Mexico	Canker fungi caused significant reductions in the yield of mature aspen stands. Damage included tree mortality from girdling cankers, top breakage, cull, and decay. Many stands had over 30 percent infection with one or more of these stem canker fungi.
Root Diseases			
Annosus root disease *Heterobasidion annosum*	Douglas-fir, Ponderosa pine, Spruce, True firs	Arizona, New Mexico	In Arizona and New Mexico, root and butt rot pathogens were responsible for an approximate 10 percent reduction in yield of infested stands. Losses may have been as high as 25 percent in some stands. *Armillaria* spp. accounted for 80 percent of the root disease damage in conifers. Other root pathogens were responsible for the remaining 20 percent. The southwest annually loses an estimated 4.8 million cubic feet to root rot.
Armillaria root disease *Armillaria* spp.	Douglas-fir, Ponderosa pine, True firs	Arizona, New Mexico	
Schweinitzii butt rot *Phaeolus schweinitzii*	Douglas-fir, True firs	Arizona, New Mexico	
Tomentosus root rot *Inonotus tomentosus*	Ponderosa pine, Spruce	Arizona, New Mexico	

Southwestern Region--Status of diseases in Arizona and New Mexico.

Disease	Host	Location	Remarks
Black stain root disease *Ceratocystis wageneri* [*Verticicladiella wageneri*]	Pinyon pine, Ponderosa pine	Arizona, New Mexico	Black stain root disease was scattered throughout the Southwest. Losses were insignificant in commercial timber.
White mottled rot *Ganoderma applanatum*	Aspen	Arizona, New Mexico	Scattered throughout the host type, the fungus caused windthrow and standing cull.
Foliage Diseases			
Elytroderma disease *Elytroderma deformans*	Pinyon pine, Ponderosa pine	Arizona, New Mexico	Elytroderma disease was widely distributed, but at low levels.
Marssonina blight *Marssonina populi*	Aspen	Arizona, New Mexico	This blight was widespread. Approximately 65,000 acres of infested aspen were detected of which approximately 42,900 were located on the Apache-Sitgreaves, Coconino, and Kaibab National Forests in Arizona and on the Carson, Gila, and Santa Fe National Forests in New Mexico. About 22,100 acres of aspen were also infested on other Federal lands, including the San Carlos, Ft. Apache, and Navajo Indian Reservations in Arizona.
Lophodermella needle cast *Lophodermella cerina*	Ponderosa pine	Arizona, New Mexico	Ponderosa pines of all ages were infected with this needle cast on the Cibola (1,450 acres) and Lincoln (1,300 acres) National Forests in New Mexico, as well as the Mescalero Indian Reservation (18,700 acres) in New Mexico.
White pine needle cast *Hypodermella arcuata*	Southwest white pine	Arizona	Many of the southwest white pines along Schultz Creek, Coconino National Forest were infected with this fungus. Infections occurred during the spring of 1987 and resulted in dieback of one-year-old needles in 1988.
Abiotic			
Frost damage	White fir	Arizona	Scattered dieback of newly expanding shoots caused by late spring frost was observed on the Coconino and Kaibab National Forests.
Winter injury	Ponderosa pine	Arizona	Ponderosa pine of all size classes exhibited tip dieback of one-year-old needles along a band on O'Leary Peak, Coconino National Forest. Winter drying resulted from desiccation of needles following transpiration without replacement of water due to cold or frozen roots.

Southwestern Region--Status of diseases in Arizona and New Mexico.

Disease	Host	Location	Remarks
Other			
True fir pest complex *Scolytus ventralis* (in white fir); *Dryocetes confusus* (in subalpine fir) *Armillaria* spp. *Heterobasidion annosum*	White fir, Subalpine fir	Arizona, New Mexico	True fir mortality was observed throughout much of the mixed conifer and spruce-fir types of the Region. Trees on a total of 690 acres were affected; 260 of these acres were National Forest lands; 330 acres were Federal lands; and the 100 remaining acres were private lands.
Looper, Abiotic complex *Galenara consimilis*	Douglas-fir, White fir	New Mexico	This complex caused light to moderate defoliation to approximately 2,600 acres of mixed conifer cover type stressed from winter drying on the Lincoln National Forest.

Intermountain Region Insects

Prepared by Julie Weatherby

Insect	Host	Location	Remarks
Douglas-fir beetle *Dendroctonus pseudotsugae*	Douglas-fir	Idaho, Utah, Wyoming	About 87,550 trees were killed by Douglas-fir beetles. Beetle activity increased on the Boise, Caribou, Challis, Payette, Salmon, Sawtooth, and Targhee National Forests in Idaho, on the Bridger-Teton National Forest in Wyoming, and on the Wasatch-Cache National Forest in Utah.
Douglas-fir tussock moth *Orgyia pseudotsugata*	Douglas-fir	Idaho	No defoliation was observed but moths were detected in pheromone-baited traps in southern Idaho.
Fir engraver beetle *Scolytus ventralis*	Grand fir	Idaho	Scattered 1- to 10-tree mortality centers were noted on the Boise, Payette, and Sawtooth National Forests in Idaho.
Gypsy moth *Lymantria dispar*	Hardwoods	Idaho, Utah	No male gypsy moths were caught in pheromone-bait traps in southern Idaho. Pheromone-bait traps and subsequent egg mass surveys detected a sizeable infestation in the Salt Lake City area.
Jeffrey pine beetle *Dendroctonus jeffreyi*	Jeffrey pine	Nevada	A small number of attacked trees were detected on the Toiyabe National Forest in Nevada.
Large aspen tortrix *Choristoneura conflictana*	Aspen	Utah	Defoliation was detected on approximately 7,000 acres.
Locust borer *Megacyllene robiniae*	Black locust	Idaho	Locust borer continued to kill black locust trees in Boise, Idaho.
Mountain pine beetle *Dendroctonus ponderosae*	Lodgepole pine, Ponderosa pine, Other pines	Idaho, Utah, Wyoming	Mountain pine beetle activity decreased throughout the Region. Tree mortality decreased from 181,300 trees in 1987 to 63,000 trees in 1988. Significant infestations occurred on the Boise, Challis, Salmon, and Sawtooth National Forests in Idaho and on the Ashley and Wasatch-Cache National Forests in Utah.
Pine butterfly *Neophasia menapia*	Ponderosa pine	Idaho	Defoliation was not noted, but small numbers of adults were observed in ponderosa pine stands.

Intermountain Region--Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Pine engraver *Ips pini*	Pines	Idaho	Significant activity associated with western pine beetle activity was noted throughout southern Idaho. Approximately 42,700 trees were killed by these two species.
Pine needle sheathminer *Zelleria haimbachi*	Lodgepole pine	Idaho	Defoliation decreased. Scattered infestations persisted on the Boise, Payette, Sawtooth, and Targhee National Forests in Idaho.
Spruce beetle *Dendroctonus rufipennis*	Engelmann spruce	Idaho, Utah, Wyoming	Epidemic populations continued to cause significant mortality on the Payette National Forest in Idaho. Approximately 44,750 infested trees were detected. Smaller infestations were present on the Boise National Forest in Idaho, the Bridger-Teton National Forest in Wyoming, and the Dixie, Fishlake, Manti-LaSal, Uinta, and Wasatch-Cache National Forests in Utah.
Spruce bud scale *Physokermes piceae*	Spruces	Idaho	Infestations of spruce bud scales were detected on ornamental spruces scattered throughout southern Idaho.
Sugar pine tortrix *Choristoneura lambertiana*	Pines	Idaho	This insect, often associated with pine needle sheathminer, continued to cause scattered defoliation of both lodgepole and ponderosa pines.
Western pine beetle *Dendroctonus brevicomis*	Ponderosa pine	Idaho	Significant activity, often associated with pine engraver beetle activity, was noted throughout southern Idaho. Approximately 42,700 trees were killed by these two species. Infestations occurred on the Boise, Payette, and Salmon National Forests in Idaho.
Western pine shoot borer *Eucosma sonomana*	Ponderosa pine	Idaho	Scattered infestations were noted in ponderosa pine plantations on the Boise and Payette National Forests.
Western spruce budworm *Choristoneura occidentalis*	Douglas-fir, Spruce, True firs, Western larch	Idaho	Conifers were defoliated on about 42,250 acres in 1988, compared to 873,600 acres in 1987. Infestations declined in total acreage and intensity on the Boise, Caribou, Challis, Payette, Sawtooth, and Targhee National Forests in Idaho and on the Dixie and Wasatch-Cache National Forests in Utah.

Intermountain Region Diseases

Prepared by James T. Hoffman

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Aspen trunk rot *Phellinus tremulae*	Aspen	Idaho, Nevada, Utah, Wyoming	Decay occurred in most aspen stands in the Region.
Comandra blister rust *Cronartium comandrae*	Lodgepole pine, Ponderosa pine	Idaho, Utah, Wyoming	Infections occurred infrequently on lodgepole pine in Idaho, Utah, and Wyoming and infrequently on ponderosa pine across southern Idaho.
Dwarf mistletoes *Arceuthobium* spp.	Douglas-fir, Lodgepole pine, Ponderosa pine, Western larch, Jeffrey pine	Idaho, Nevada, Utah, Wyoming	These continued to be the most widespread and frequently observed pests in southern Idaho. Suppression projects removed infected overstory trees from 3,848 acres.
Limb rust *Peridermium filamentosum*	Ponderosa pine	Utah	Infection was detected in stands on the Dixie National Forest.
Red ring rot *Phellinus pini*	Western larch, True firs, Spruce, Douglas-fir, Pines	Idaho, Utah, Wyoming	This fungus occurred throughout the Region in stands of mature conifers. Intensity of infection varied.
Rust-red stringy rot *Echinodontium tinctorium*	Grand fir, White fir, Subalpine fir	Idaho, Nevada	Decay caused by this fungus was common in mature and overmature stands of true firs.
Stalactiform blister rust *Cronartium coleosporioides*	Lodgepole pine	Idaho, Utah, Wyoming	This rust occurred in localized areas of host type across the Region. Heavy infection was noted in several areas.
Western gall rust *Endocronartium harknessii*	Lodgepole pine, Ponderosa pine	Idaho, Utah, Wyoming	Gall rust occurred throughout host types. Infection levels varied.

Intermountain Region--Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Root Diseases			
Annosus root disease *Heterobasidion annosum*	Douglas-fir, Lodgepole pine, Ponderosa pine, True firs	Idaho, Nevada, Utah, Wyoming	This fungus has caused root and butt rot of true firs and root rot of young ponderosa pines. Infection frequently has resulted in death of young ponderosa pines. Infrequent root infection has been noted on Douglas-fir.
Armillaria root disease *Armillaria* sp.	Douglas-fir, Grand fir, Pines, Spruce	Idaho, Utah, Wyoming	While evidence of *Armillaria* may be found throughout the Region, in most instances it has functioned as a weak pathogen or saprophyte.
Schweinitzii butt rot *Phaeolus schweinitzii*	Douglas-fir, Ponderosa pine	Idaho	Decay was common in mature and overmature forests, especially those having a recent fire or logging history. The fungus was often found associated with other root diseases and bark beetles.
Tomentosus root rot *Inonotus tomentosus*	Douglas-fir, Spruce, Subalpine fir	Idaho, Utah	The fungus has been commonly found with *P. schweinitzii* as a root and butt rot of pole-size Douglas-fir and spruce. In Idaho, this disease was found less often on subalpine fir.
Foliage Diseases			
Ash yellows	Velvet ash	Utah	In addition to an infection center located in Las Vegas, Nevada, several dead and declining velvet ash trees were found in Zion National Park.
Douglas-fir needle cast *Rhabdocline* spp.	Douglas-fir	Idaho	Widespread occurrence was observed, but only light-to-moderate defoliation was noted, throughout the range of Douglas-fir in southern and eastern Idaho.
Elytroderma disease *Elytroderma deformans*	Ponderosa pine	Idaho	Moderate levels of infection were noted in stands on Little Donner Summit near Cascade and on Manhattan Creek near Idaho City.

Disease	Host	Location	Remarks
Fir broom rust *Melampsorella caryophyllacearum*	Subalpine fir	Idaho, Utah, Wyoming	Infection was scattered throughout the host type, but high infection levels were reported in forested areas south of Twin Falls and Burley, Idaho.
Fir needle cast *Lirula* spp.	Subalpine fir, Grand fir	Idaho	Infected stands were found on the Council and Weiser Ranger Districts of the Payette National Forest.
Fir needle rust *Pucciniastrum* sp.	Subalpine fir	Idaho	Seedling or sapling size trees at higher elevations around McCall, Idaho were heavily infected.
Larch needle cast *Meria laricis*	Western larch	Idaho	Incidence and severity of infection throughout the host type in west-central Idaho were very low.
Limber pine needle cast *Lophodermella arcuata*	Limber pine	Wyoming	The disease, previously observed on the Bridger-Teton National Forest, was not observed in 1988.
Marssonina blight *Marssonina populi*	Aspen	Idaho, Utah, Wyoming	Scattered incidence of light intensity was noted throughout most of the host range.
Spruce broom rust *Chrysomyxa arctostaphyli*	Engelmann spruce	Idaho, Utah, Wyoming	Infection occurred scattered throughout the host type. The disease was common in eastern Idaho.
Nursery Diseases			
Fusarium root disease *Fusarium oxysporum*	Nursery grown conifer seedlings	Idaho	Mortality of 1-0 and 2-0 conifer seedlings occurred at the Lucky Peak Nursery, Boise National Forest, Idaho.
Fusarium cortical stem rot *Fusarium avenaceum*	Nursery grown conifer seedlings	Idaho	Mortality of 1-0 and 2-0 conifer seedlings occurred at the Lucky Peak Nursery Boise National Forest, Idaho.
Phytophthora/pythium root rot *Phytophthora* spp. *Pythium* spp.	Spruce	Idaho	These fungi were identified on seedlings and soil isolations at the Lucky Peak Nursery, Boise National Forest, Idaho.

Disease	Host	Location	Remarks
Abiotic			
Drought Effects	All vegetation	Regionwide	Premature needle drop, leaf scorch, and seedling mortality were observed due to 3 consecutive years of below normal precipitation. Damage was most acute in southern Idaho.

Pacific Southwest Region Insects

Prepared by John Dale

Insect	Host	Location	Remarks
A coconut palm weevil *Rhobdoscelus asperipennis*	Coconut palm	Northern Mariana Islands	This weevil attacked old palms on Rota.
A coneworm *Dioryctria* sp.	Sugar pine	Northern California	Larvae of a coneworm caused considerable damage to cones of rust-resistant sugar pines at the Badger Hill Breeding Arboretum, El Dorado County.
A cutworm *Noctuidae*	White fir, Red fir, Jeffrey pine	Central California	Unacceptable mortality to container stock occurred on a 47-acre revegetation project on the Sierra National Forest, Fresno County. True firs suffered the most damage.
A thrips *Rhiyiphorothrips pulchellus*	Mountain apple	Hawaii (Oahu)	It is a potential pest of *Leucaena* spp. and was first discovered in September 1988.
A thrips *Scirtothrips dorsalis*	False heather	Hawaii (Maui)	It is a potential pest of *Acacia* spp. and was first discovered in 1987.
Balsam twig aphid *Mindarus abietinus*	White fir	Northern California	Large populations continued to damage 2-0 white fir seedlings at the Placerville Nursery, El Dorado County, and 1-0 stock was involved.
California flatheaded borer *Melanophila californica*	Ponderosa pine	California	Hundreds of fire-scorched pine were attacked in 1987 fire areas of Mendocino, Lake and Colusa Counties. Mortality was light. Ponderosa pine mortality was widespread on the San Jacinto Ranger District, San Bernardino National Forest, Riverside County and was associated with attacks by pine engraver beetles.
Cedar bark beetles *Phleosinus* sp.	Incense-cedar, Port-Orford-cedar	Northern California	Incense-cedar mortality was scattered except for local areas of concentrated mortality in Shasta and Placer Counties. Beetles were associated with localized mortality of Port-Orford-cedar in Del Norte County.
Phleosinus sequoiae	Redwood	Northern California	*P. sequoiae* attacked 10 to 15 redwoods near Navarro and Point Arena, Mendocino County.

Pacific Southwest Region--Status of insects in California, Hawaii, Guam, the Commonwealth of the Northern Mariana Islands, the Federated States of Micronesia and the Republic of Palau

Insect	Host	Location	Remarks
Coconut scale *Aspidiotus destructor*	Various fruit trees and palms	Northern Mariana Islands	Damage was found on Rota and Tinian in the Northern Mariana Islands.
Douglas-fir beetle *Dendroctonus pseudotsugae*	Douglas-fir	Northwestern California	Small stands of dead trees were noted in Mendocino, Lake, and Humboldt Counties. Other attacks were scattered.
Douglas-fir engraver *Scolytus unispinosus*	Douglas-fir	Northern California	This pest was part of a complex of pests involved in branch- and top-kill of sapling and small Douglas-firs in Lake, Mendocino, Humboldt, Del Norte, Trinity, and Amado Counties.
Douglas-fir tussock moth *Orgyia pseudotsugata*	White fir	Northern California	The outbreak covered an area ten times larger than in 1987. In several discrete areas of Lassen, Tehama and Plumas Counties, 105,000 acres were infested. Populations appeared to decline on approximately 35,000 acres on the Plumas National Forest.
Douglas-fir twig weevil *Cylindrocopturus furnissi*	Douglas-fir	Northern California	Populations increased. Branches less than one inch in diameter were infested in thousands of trees in Mendocino, Humboldt, Trinity, and Del Norte Counties.
Eucalyptus borer *Phoracantha semipunctata*	Eucalyptus	Southern California	There was a small outbreak in Orange County. This woodborer did not appear to increase its range. However, the pest was reported spreading back to Catalina Island, Los Angeles County.
Fir engraver beetle *Scolytus ventralis*	White fir, Red fir	California	Mortality of single trees or small stands was common throughout the mixed-conifer type. This was noted, particularly, in Nevada, Placer, Shasta, Fresno, Sierra, Kern, Mendocino, and Lake Counties and in the Lake Tahoe Basin, El Dorado County. Dwarf mistletoes and annosus root disease often were associated with mortality.
Fir flatheaded borer *Melanophila drumondi*	Douglas-fir	Northern California	Mortality of individual mature and overmature trees was scattered. Branch flagging and bole attacks were common on marginal sites in the Klamath River drainage.

Insect	Host	Location	Remarks
Fruit-piercing moth *Othreis fullonia*	Citrus, Guava, Coral tree	Guam, Northern Mariana Islands	Adults and larvae continued to cause severe damage to fruit in the Northern Mariana Islands and Guam. Punctures of feeding moths served as entry points for disease organisms. Larvae also fed on Erythrina leaves.
Gouty pitch midge *Cecidomyia piniinopis*	Ponderosa pine	Northern California	Reports indicated that the level of damage was considerably lower.
Gypsy moth *Lymantria dispar*	Hardwoods, Ornamentals	California	Thirteen moths were trapped in six counties. Neither eggs nor pupal cases were found. Moths were trapped in Josephine County, Oregon. The threat of infestation from Oregon declined greatly since 1984.
Hibiscus mealybug *Nipaecoccus vastator*	*Leucaena* spp., Coconut palm	Northern Mariana Islands	Populations have been controlled as a result of the introduction of a hymenopterous parasite from Hawaii.
Jeffrey pine beetle *Dendroctonus jeffreyi*	Jeffrey pine	California	Tree mortality was noted in Lassen, El Dorado, Fresno and Tulare Counties.
Lodgepole needleminer *Coleotechnites milleri*	Lodgepole pine	Yosemite National Park	Populations in the refuge areas of Yosemite National Park were up 100 to 200 percent from a 20-year low in 1987, but damage was only slightly greater.
Mango shoot caterpillar *Penicillaria jocosatrix*	Mango	Guam	Larvae feed on young leaves and flowers. Occasionally, poor mango production was attributed to the damage.
Melon fly *Dacus cucurbirtae*	Avocado, Citrus, Figs, Mango	Northern Mariana Islands	An eradication program by the Agricultural Research Service began on Rota in 1988.
Modoc budworm *Choristoneura retiniana*	White fir	Northern California	Light to moderate defoliation occurred on 20,000 acres of Modoc County. This was the smallest infested acreage since the outbreak began five years ago. No tree mortality was reported.
Mountain pine beetle *Dendroctonus ponderosae*	Lodgepole pine, Ponderosa pine, Sugar pine	Central and northern California	About two sugar pines per acre were attacked on Mountain Home State Forest in Tulare County. Sugar pines also were attacked on Latour State Forest in Shasta County and in Mendocino and Lake Counties.

Insect	Host	Location	Remarks
Nantucket pine tip moth *Rhyacionia frustrana*	Monterey pine	Central and southern California	The range of this insect remained Alameda, Fresno, and Santa Cruz Counties in the North, and Kern, Orange, San Bernardino, and San Diego Counties in the South.
Pine engraver beetles *Ips* spp.	Pines	California	Damage was associated with western pine beetles in Amador, El Dorado, Fresno, Kern, Modoc, Placer, Shasta, and Trinity Counties. Pole-size Jeffrey pines were killed in eastern Plumas County, and large Jeffrey pines were killed outright or in association with California flatheaded borers on the San Bernardino National Forest, Riverside County. Monterey and ponderosa pines were attacked in Santa Clara, Alameda, and Mendocino Counties. Over 500 Monterey pines were attacked in Santa Cruz County. Few attacks were noted on ponderosa and sugar pine in the 1987 fire areas.
Pine reproduction weevil *Cylindrocopturus furnissi*	Ponderosa pine	Northern California	Mortality occurred in pine plantations two to six years old that were stressed by brush competition and low site quality.
Poinciana looper *Pericyma cruegeri*	Flame tree, Young Albizia, and Other leguminous species	Guam, Northern Mariana Islands	This insect was the most important pest of poinciana. Extensive damage occured on new shoots.
Redbanded thrips *Selenothrips rubrocinctus*	Avocado, Cashew, Cacao, Mango	Guam, Mariana Islands	Leaf scarification was common on all hosts. The insect was widely distributed in the Mariana Islands and the tropics in general.
Red turpentine beetle *Dendroctonus valens*	Pines	California	Ponderosa pine and sugar pine were attacked in Fresno and Amador Counties and ponderosa pine in El Dorado County. Activity in Yosemite National Park was in association with the limited mortality caused by the western pine beetle. Hundreds of Monterey pines were attacked in Santa Cruz, Santa Clara, Alameda, and Napa Counties. Attacks in Santa Cruz County were often associated with trees infected with pitch canker. Many scorched pines were attacked in 1987 fire areas of Lake, Mendocino, and Colusa Counties. Mortality was very light in each situation.

Insect	Host	Location	Remarks
Spiraling whitefly *Aleurodicus dispersus*	Cassava, Coconut palms, Fruit, Ornamental and Shade trees	Guam	This pest rendered ornamentals unsightly and and reduced the productivity of fruit trees in Guam.
Tangantangan psyllid *Heteropsylla incisa*	Tangantangan, Samanea saman, and Other *Leucaena* species	Guam, Hawaii, Northern Mariana Islands	In Guam the giant hybrid tangantangan has been less tolerant to the T. psyllid than tangantangan species that have been on the island for decades. T. psyllid populations in Hawaii have fluctuated with flushes of new foliage, and insects have been controlled by coccinellid beetles. In the Mariana Islands, local populations declined.
Tent caterpillar *Malacosoma* sp.	Bitterbrush, Blue oak	Eastern and northern California	An infestation on antelope bitterbrush in Inyo and Mono Counties declined significantly. A virus and a bacterium, *Bacillus cereus*, appeared to be partially responsible. Severe defoliation of blue oak, *Quercus douglasii*, occurred in the northern Sacramento Valley in Tehama and Shasta Counties. Injury was minimal as almost all branches and trees refoliated.
Twig beetles *P. pseudotsugae* and other *pityophthorus* spp.	Ponderosa pine, Douglas-fir, White fir	Northern California	Hundreds of pines were attacked in Santa Clara, Santa Cruz, and Mendocino Counties. Young Douglas-firs in Trinity and Humboldt Counties were attacked by *P. pseudotsugae*. White fir in Donner State park, El Dorado County were attacked.
Western pine beetle *Dendroctonus brevicomis*	Coulter pine, Ponderosa pine	California	This beetle was a primary agent of ponderosa pine mortality in the foothill areas of the western slope of the Cascade and northern Sierra Nevada Mountains. Abundant mortality also occurred in the southern Sierra Nevada. Drought, annosus root disease, and black stain root disease were important precursors to mortality.
Western pine shoot borer *Eucosma sonomana*	Ponderosa pine	Northern California	This insect was common in plantations on the Buckhorn Burn, Oak Knoll Ranger District, Klamath National Forest, Siskiyou County.
White fir needleminer *Epinotia meritana*	White fir	Northern California	Moderate to heavy defoliation occurred on white and red fir on over 1,000 acres of the Kings River District, Sierra National Forest, Fresno County. Little direct or secondary mortality was observed.

Pacific Southwest Region Diseases

Prepared by Susan Frankel

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Botryosphaeria canker *Botryosphaeria ribis*	Ceanothus, Chamise, Manzanita	Southern California	Chaparral dieback continued in many low elevation areas of Southern California. Thus far, the fungus has been recovered from eight brush species. Primary concern was the fire hazard created by large areas of dead brush. Air pollution and moisture stress may be predisposing plants to attack.
Cassytha *Cassytha filiformis*	All afforestation species	Guam	This leafless, vinelike epiparasitic plant has no natural enemies on Guam.
Citrus canker *Xanthomonas citri*	Citrus species	Guam, Northern Mariana Islands	This bacterial disease was prevalent on Guam and may be the cause of recent citrus decline on Rota. Symptoms included brown lesions on leaves, stem, bark, and the rind of fruit.
Dodder *Cuscuta* sp.	Native vegetation	Guam	It has also been found in Hawaii and Yap.
Dwarf mistletoes *Arceuthobium* spp.	Douglas-fir, Pine, True firs	California	The status of dwarf mistletoes has not changed substantially from previous years. Mistletoes infected conifers on 2.3 million acres of commercial forest land and contributed to an estimated 100 million cubic feet of mortality.

Pacific Southwest Region--Status of diseases in California, Hawaii, Guam, the Commonwealth of the Northern Mariana Islands, the Federated States of Micronesia and the Republic of Palau

Disease	Host	Location	Remarks
Dwarf mistletoes (continued)			Suppression projects were initiated on the Angeles National Forest, Kings Canyon National Park, and the Lake Tahoe Basin Management Unit. Private landowners near Mendocino, Mendocino County, were concerned with the levels of infection in Bishop pine.
Fusicoccum canker *Fusicoccum* sp.	Pacific madrone	El Dorado, Santa Cruz, Mendocino, and Lake counties, California	The canker continued to cause branch and tree mortality throughout much of the north coastal region.
Pitch canker *Fusarium subglutinans* (= *F. Moniliforme* var. subglutinans)	Aleppo Pine, Bishop Pine, Italian Pine, Stone Pine, Monterey pines	Central coastal California and three locations in southern California	Over 1,000 Monterey pine were affected in Santa Cruz County, and a lesser number were affected in Alameda County. The Santa Cruz infection expanded into northern Monterey County, while the Alameda area remained static. Canker infections found in Christmas tree plantings in Escondido, San Diego County, and Torrance, Los Angeles County, were believed to have originated from infected nursery stock. Other localized infections were found in San Francisco, Santa Barbara, and San Luis Obispo Counties, but was eliminated in San Luis Obispo County.
Phomopsis canker *Phomopsis lokoyae*	Douglas-fir	Northern California	The fungus was involved in branch flagging and top-killing of sapling and pole-size trees in overstocked or brushy areas. Damage appeared to be related to drought stress. Additional unidentified fungi were isolated, but the exact cause of the damage was not understood.
True mistletoe *Phoradendron* spp.	Oaks, Sycamores, Cottonwoods, and other Hardwoods	California	Infections were common on many native and exotic hardwoods in California.

Disease	Host	Location	Remarks
Western gall rust *Endocronartium harknessii*	Lodgepole pine, Monterey pine	Northern California	This rust was widespread on lodgepole pines in north-central and northeastern California. Hundreds of infected pines were reported from near McKinleyville, Humboldt County.
White fir mistletoe *Phoradendron bolleanum* subsp. *pauciflorum*	White fir	Central and southern California	Incidence was severe in some stands in southern Sierra Nevada and in southern California.
White pine blister rust *Cronartium ribicola*	Sugar pine, Western white pine	Central and northern California	This disease was reported throughout the Sierra Nevada and northern mountains. Planting of non-resistant sugar pine was curtailed because of the rust. Efforts to identify rust-resistant pines increased.
Root Diseases			
Annosus root disease *Heterobasidion annosum*	Conifers, Some Hardwoods	California	About 1.4 million acres of pine type and 0.6 million acres of true fir type were infected with this disease. Incidence of the fungus in stumps in four older sale areas in eastside pine ranged from 14 to 24 percent. Two mixed conifer stands similarly surveyed had 0 and 4 percent infection levels. This disease has been associated with tree failures that have caused property damage and personal injury in recreation forests.
Armillaria root disease *Armillaria* sp.	Conifers, Hardwoods	Northwestern California	This disease was reported from Lake, Mendocino and Del Norte Counties, primarily from trees under stress.
Black stain root disease *Ceratocystis wageneri*	Douglas-fir, Ponderosa pine, Singleleaf pinyon pine	California	Plantations of Douglas-fir in northwestern California were significantly affected. There were concerns about potential effects of this disease.
Flame tree root disease *Phellinus noxius*	Flame tree	Guam, Northern Mariana Islands	Tree mortality occurred on Rota and Saipan.
Port-Orford-cedar root disease *Phytophtora lateralis*	Port-Orford-cedar	Northern California	The disease was widespread in the Smith River drainage, and tree mortality occurred in the towns of Crescent City and Trinidad.

Disease	Host	Location	Remarks
Foliage Diseases			
Elytroderma disease *Elytroderma deformans*	Jeffrey pine, Ponderosa pine	California	Signs and symptoms of the disease were more common in 1988 than in previous years. Infected areas in El Dorado, Kern, Placer, Shasta, and San Bernardino Counties were reported.
Mango scab *Elsinoe mangiferae*	Mango	Guam	This fungus attacks young leaves, flower heads, twigs, and fruits. It causes a wrinkling distortion and dropping of leaves and fruit.
Vascular Wilts and Declines			
Dutch elm disease *Ceratocystis ulmi*	Elm	San Francisco Bay Area, Nevada	Incidence increased , but remains confined to the Bay Area. New locations were found in Alameda, Contra Costa, and Marin Counties. Infection was confirmed on 255 elm trees. Samples diagnosed at the Santa Rosa Lab suggested the disase had a good foothold in Reno, Nevada.
Joga decline Cause unknown	Joga	Rota	This disease caused defoliation in the high limestone forests on the island.
Norfolk Island pine decline Cause unknown	Norfolk Island pine	Hawaii	The cause is unknown; symptoms include branch dieback and a general unthrifty appearance.
Pingelap disease Cause unknown	Breadfruit	Guam	This disease is often associated with droughts. Dieback begins at the top and proceeds downward until the tree dies. However, new sprouts often arise from the root system. Usually trees of bearing age are attacked, but all ages can be attacked.
Nursery Diseases			
Fusarium hypocotyl rot *Fusarium oxysporum*	Douglas-fir, Ponderosa pine	California	Heat stress followed by *Fusarium oxysporum* infection resulted in damage and mortality to 1-0 size seedlings in the Humboldt Nursery.
Phomopsis canker *Phomopsis occulta*	Douglas-fir	California	Minor damage to 2-0 size Douglas-fir was reported at the Humboldt Nursery.

Disease	Host	Location	Remarks
Abiotic			
Air pollution effects			
Ozone	Jeffrey pine, Ponderosa pine	Central and southern California	Twenty-eight ozone trend plots on the Sequoia National Forest were surveyed. Compared to 1986, 68 percent of the plots showed fewer injuries, 25 percent had more injuries, and 7 percent remained unchanged. Trees generally had more years of needle retention. Overall injury levels remained in the light to moderate range.
Salt damage	Conifers, Shrubs	Lake Tahoe Basin	Damage caused by roadside salt was unusually severe in the Lake Tahoe Basin.
Drought and heat injury	Pine, Fir species, Redwood	California	Excessive heat and drought injury were reported from numerous locations scattered throughout the state.
Other			
Bud rot *Phytophthora palmivora*	Coconut palm, Ifil, Joga	Guam, Northern Mariana Islands	Bud rot, wilt, and leaf drop of ifil and joga occurred on Rota.
Cadang-cadang yellow mottle virus	Coconut palm	Guam	The disease has caused a serious decline in copra production. There is no method of control.
Rhizopus rot *Rhizopus artocarpi*	Jackfruit	Guam	This fungus has caused premature fruit drop and interior fruit rot. It has occured more abundantly during the rainy season. Fungicides have been applied as a preventative measure.

Pacific Northwest Region Insects

Prepared by David R. Bridgwater

Insect	Host	Location	Remarks
Douglas-fir beetle *Dendroctonus pseudotsugae*	Douglas-fir	Oregon, Washington	Douglas-fir beetle damage increased to 19 million cubic feet from slightly over 1 million cubic feet in 1987. Losses increased east of the Cascade Range and occurred on over 212,000 acres. The greatest damage was reported on the Colville, Umatilla, Wallowa-Whitman, and Malheur National Forests.
Fir engraver beetle *Scolytus ventralis*	True firs	Oregon, Washington	Fir engraver activity continued to increase in Oregon and Washington. Some of the fir engraver damage occurred on sites infected with either laminated root rot, armillaria root disease, or annosus root disease, all of which weaken true firs and make them susceptible to beetle attacks. However, much of the loss in 1988 was attributed to three years of less-than-normal precipitation. Total losses in 1988 (5.7 million cubic feet) occurred on over 267,000 acres compared to (639,200 cubic feet) in 1987 on 24,570 acres .
Gypsy moth *Lymantria dispar*	Conifers, Hardwoods	Oregon, Washington	Eradication projects in Oregon were conducted on 1,200 acres in Lane and Josephine counties. Trapping efforts detected 10 moths in 1988, down from 80 moths in 1987. No moths were trapped on Federal lands in Oregon, and only one moth was caught on Federal land in Washington at Fort Lewis.
Modoc budworm *Choristoneura retiniana*	Douglas-fir, True firs	Southern Oregon	Modoc budworm defoliation continued to decrease in southern Oregon in true fir stands on the Fremont and Winema National Forests. Acres of visible defoliation decreased to about 13,600 in 1988 from 63,200 in 1987.

Insect	Host	Location	Remarks
Mountain pine beetle *Dendroctonus ponderosae*	Lodgepole pine, Ponderosa pine, Western white pine, Other pines	Oregon, Washington	In Washington, losses continued at about the same level as 1987 and increased only on the Okanogan National Forest. In Oregon, losses decreased slightly on the Deschutes, Fremont, and Winema National Forests. In 1988, approximately 1.5 million acres were infested: 1.3 million acres in Oregon and 215,000 in Washington. Beetle losses in 1988 consisted of 1.2 million acres (43 million cubic feet) of lodgepole pine, 258,000 acres (2.6 million cubic feet) of ponderosa pine, 52,000 acres (2.3 million cubic feet) of western white pine, and about 14,000 acres of other pine species.
Pine engraver beetles *Ips* spp.	Ponderosa pine	Oregon, Washington	Pine engraver activity increased to over 27,300 acres. Most of the activity was on the Ochoco National Forest.
Spruce beetle *Dendroctonus rufipennis*	Engelmann spruce	Oregon, Washington	Spruce beetle activity increased in Oregon and Washington. Losses occurred on over 72,300 acres (8.7 million cubic feet) in 1988 compared to 31,030 acres (5.4 million cubic feet) in 1987. The outbreak on the Wallowa-Whitman National Forest accounted for 68,000 acres (8.6 million cubic feet) of the infested areas.
Western pine beetle *Dendroctonus brevicomis*	Ponderosa pine	Oregon, Washington	Tree mortality caused by the western pine beetle decreased slightly in Oregon and Washington to 2.3 million cubic feet in 1988 from 2.8 million cubic feet in 1987 . Greatest losses occurred on the Malheur National Forest.

Insect	Host	Location	Remarks
Western spruce budworm *Choristoneura occidentalis*	Douglas-fir, Engelmann spruce, True firs, Western larch	Oregon, Washington	Visible defoliation caused by the western spruce budworm decreased to 3.0 million acres in 1988 from 4.1 million acres in 1987. In Oregon, budworm defoliation decreased on the Malheur, Mt. Hood, Willamette, Deschutes, Ochoco, Wallowa-Whitman, and Umatilla National Forests, on the Warm Springs Indian Reservation, and on intermingled State and private lands. In Washington, the size of the budworm infestation on the Okanogan and Wenatchee National Forests and adjacent State and private lands decreased.

Pacific Northwest Region Diseases

Prepared by Ellen M. Goheen

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Dwarf mistletoes *Arceuthobium* spp.	Various conifers	Oregon, Washington	Losses due to this group of disease-causing plants declined. However, dwarf mistletoes still caused an estimated loss of 131 million cubic feet of timber in Oregon and Washington in 1988.
Branch cankers *Phomopsis* spp. *Sclerophoma* spp. *Dermea* spp. *Cytospora* spp.	Douglas-fir	Oregon, Washington	Top, branch and whole tree killing, associated primarily with drought and secondarily with complexes of canker fungi, were found on plantations and in pole-size stands of the Cascades.
Stem decay *Phellinus pini* *Echinodontium tinctorium* And other Basidiomycetes	Various conifers	Oregon, Washington	Stem decay fungi destroyed enormous volumes of wood. Most losses occurred in younger stands of thin-bark species that were susceptible to wounding during stand entries. Wounding of residual trees activated dormant infections and made trees susceptible to new infections.
White pine blister rust *Cronartium ribicola*	Sugar pine, Western white pine	Oregon, Washington	Annual losses of western white and sugar pines from blister rust in Oregon and Washington have been estimated at 15 million cubic feet. Rust-resistant planting stock was available for regenerating stands. Interest in pruning white pine stands continued to increase.

Pacific Northwest Region--Status of diseases in Oregon and Washington.

Disease	Host	Location	Remarks
Root Diseases			
Root diseases	Various conifers	Oregon, Washington	Root diseases were among the most serious pest problems in Oregon and Washington forests. The incidence of root disease increased, often in direct response to human activity. Annual losses to root diseases on all ownerships has been estimated at over 170 million cubic feet. A root disease model that operates as part of the Stand Prognosis Model was being tested. The model can be used to project losses caused by Armillaria root disease and laminated root rot.
Annosus root disease *Heterobasidion annosum*	True firs, Western hemlock, Ponderosa pine	Oregon, Washington	Annosus root disease was responsible for extensive losses in many partially cut white and grand fir stands in southern and eastern Oregon. Most loss was due to tree mortality. Evidence pointed to extensive infection throughout eastern Oregon and Washington. Severity was expected to increase with time. Annosus root disease was observed with increasing frequency in ponderosa pine stands on very dry sites in southeast Oregon. Attempts to further characterize those site and stand conditions were being made.
Armillaria root disease *Armillaria ostoyae*	Various conifers	Oregon, Washington	The most serious losses to this disease occurred east of the Cascades. Losses west of the Cascades were usually confined to stressed stands, such as off-site plantings. Planting tolerant or resistant species was being practiced as a control measure.

Pacific Northwest Region--Status of diseases in Oregon and Washington.

Disease	Host	Location	Remarks
Black stain root disease *Ceratocystis wageneri*	Douglas-fir	Oregon, Washington	In southwestern Oregon, this was by far the most commonly encountered disease in Douglas-fir plantations. It appeared to be particularly damaging where disturbances had occurred, especially in roadside Douglas-fir cut back by mechanical choppers. Losses were also greater on tractor-logged sites, which have greater soil compaction, than on cable-logged sites. A survey of 500 10- to 30-year-old Douglas-fir plantations on the Medford District, Bureau of Land Management, was completed. Approximately 18 percent of the plantations were infected, although severity was generally low.
Laminated root rot *Phellinus weirii*	Douglas-fir, Grand fir, White fir	Oregon, Washington	Laminated root rot was estimated to have removed about 8 percent of the Douglas-fir type west of the Cascades from full production. The total acreage infected may actually have been closer to 10 percent of the Douglas-fir. Damage was also severe in some East Side grand and white fir stands. Tolerant and resistant species were favored or planted to suppress this disease.
Port-Orford-cedar root disease *Phytophthora lateralis*	Port-Orford-cedar	Southwestern Oregon	Port-Orford-cedar root disease continued to cause widespread mortality of Port-Orford-cedar in southwestern Oregon.
Foliage Diseases			
Dothistroma needle blight *Mycosphaerella pini* [*Dothistroma septospora* (=*Dothistroma pini*)]	Douglas-fir, Lodgepole pine, Ponderosa pine	Oregon, Washington	Incidence of several foliage diseases was relatively low because of dry weather in the spring and fall of the past 4 years.
Douglas-fir needle cast *Rhabdocline pseudotsugae*			
Elytroderma disease *Elytroderma deformans*			

Pacific Northwest Region--Status of diseases in Oregon and Washington.

Disease	Host	Location	Remarks
Nursery Diseases			
Damping-off	Most conifers	Oregon, Washington	Loss of seedlings, before and shortly after emergence accounted for the majority of mortality in Pacific Northwest bareroot nurseries. Losses ranged from less than 1 percent to over 20 percent in various lots. Fumigation provided the best control of damping-off.
Douglas-fir canker diseases *Phoma eupyrena* *Fusarium roseum* *Botrytis cinerea* *Phomopsis* spp.	Douglas-fir	Oregon, Washington	Damage was scattered, with less than 1 percent of the crop affected in most nurseries. Fungicide applications were helpful when cankers were above ground and not covered with soil collars.
Gray mold *Botrytis cinerea*	Douglas-fir	Oregon, Washington	Damage by gray mold has been low (less than 1 percent of crop affected) due to applications of preventative fungicide and regulation of seedbed densities.
Fusarium root and hypocotyl rots *Fusarium oxysporum*	Various conifers	Oregon, Washington	Scattered losses were reported for most species; mortality was heavy in sugar pine.
Larch needle cast *Meria laricis*	Western larch	Washington	Dry weather and fungicide treatments resulted in little infection or defoliation during 1988.
Phytophthora root rot *Phytophthora* spp.	Douglas-fir, other conifers	Oregon, Washington	Moderately dry weather throughout summer, fall, and winter caused disease severity to be relatively low in 1988. Seedbed seedling damage was confined primarily to nursery beds with poor drainage or compaction layers in the rooting zone.

Pacific Northwest Region--Status of diseases in Oregon and Washington.

Southern Region Insects

Prepared by Wesley A. Nettleton

Insect	Host	Location	Remarks
Black turpentine beetle *Dendroctonus terebrans*	Southern pines	Regionwide	Drought stress and late spring wildfires pre-disposed many forest stands to moderate losses.
Coneworms *Dioryctria amatella* *Dioryctria clarioralis* *Dioryctria disclusa* *Dioryctria merkeli*	Southern pines	Regionwide	Pheromone trap catches indicated a reduction in population levels of all species. However, certain orchards continued to sustain significant losses. The Arkansas Forestry Commission reported that for second year conelets between April and July, losses were 50 to 75 percent.
Eastern tent caterpillar *Malacasoma americanum*	Black cherry	Tennessee	Although populations were highest in middle Tennessee, tent caterpillars were evident statewide.
Fall webworm *Hyphantria cunea*	Hardwoods	Arkansas	Populations were high statewide.
Forest tent caterpillar *Malacosoma disstria*	Tupelo gum, Black cherry, and other Hardwoods	Arkansas, Louisiana	Partial to complete defoliation occurred on 356,000 acres in south Louisiana. This resulted in a growth loss of 104,000 cords valued at $520,000. Heavy, widespread defoliation occurred on pecan and persimmon in Arkansas.
Fruittree leafroller *Archips argyrospila*	Baldcypress	Louisiana	Severe defoliation (>50 percent of the crowns turn red) occurred on 208,000 acres in the Atchafalaya Basin. Light (<50 percent) defoliation occurred on an additional 148,000 acres. This resulted in a growth loss of 54,500,000 board feet valued at $4,360,000.
Gypsy moth *Lymantria dispar*	Hardwoods	North Carolina, South Carolina, Tennessee, Virginia	Infestation occurred in the northern half of Virginia. The quarantine was extended south throughout Augusta County, south and east to the city of Richmond, and south throughout the Virginia tidewater counties to the North Carolina line. In North Carolina, Currituck and the northern portion of Dare Counties were quarantined.

Southern Region--Status of insects in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia; and Puerto Rico and the Virgin Islands

Insect	Host	Location	Remarks
Gypsy moth (continued)			Defoliation occurred on 191,000 acres in Virginia. Isolated infestations were present in North Carolina, South Carolina, Tennessee, and Virginia. Male moths were trapped in Arkansas, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Texas, and Virginia.
Ips beetle *Ips hoppingi*	Pinyon pine	Texas	In Real and Kinney Counties in west Texas 600 to 800 trees were killed.
Larch sawfly *Pristiphora erichsonii*	Larch	North Carolina	The infestation continued in Transylvania County.
Larger elm leaf beetle *Monocesta coryli*	Elm	Louisiana	Scattered defoliation was observed in the Florida Parishes of Louisiana.
Loblolly pine sawfly *Neodiprion taeda linearis*	Loblolly pine	Arkansas, Tennessee	Defoliation occurred in Calhoun and Ouachita Counties, Arkansas. Southwestern and middle Tennessee also were affected, but defoliation was generally less than 50 percent.
Nantucket pine tip moth *Rhyacionia frustrana*	Loblolly pine, Shortleaf pine	Arkansas	Heavier than normal populations were reported.
Pine engraver beetles *Ips avulsus* *Ips grandicollis* *Ips calligraphus*	Southern pines	Regionwide	Pine engraver beetles affected shade trees in urban areas throughout the South. Arkansas, Oklahoma, and Texas lost more timber to Ips than to Southern pine beetle. Increased activity was due to reduced rainfall for the second year.
Pine needleminer *Exoteleia pinifoliella*	Loblolly pine, Slash pine, Pond pine	Florida	Damage occurred on 6,000 acres in Percy County.
Pine webworm *Tetralopha robustella*	Shortleaf pine	Arkansas	Light defoliation was observed in progeny test areas.
Redheaded pine sawfly *Neodiprion lecontei*	Shortleaf pine, Loblolly pine	Arkansas	Light defoliation occurred in small areas of the north central part of the state.

Southern Region--Status of insects in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia; and Puerto Rico and the Virgin Islands

Insect	Host	Location	Remarks
Sand pine cone midge Unknown species	Sand pine	Florida	Unknown midges, causing hypertrophy of developing first-year flowers, destroyed 21 percent of the 1988 flower crop on the Ocala sand pine seed orchard.
Seedbugs *Leptoglossus corculus* *Tetyra bipunctata*	Southern pines	Florida, Georgia, Louisiana, North Carolina, South Carolina	Populations were down. Minimal losses were detected.
Slash pine flower thrips *Gnophothrips fuscus*	Slash pine	Florida	Minimal cone losses were reported.
Slug oak sawfly *Caliroa* sp.	White oak	North Georgia	Defoliation occurred on 10,000 acres of National Forest System and private land. Populations were concentrated in Fannin County.
Southern pine beetle *Dendroctonus frontalis*	Southern pines	Regionwide	Populations declined in the western Gulf states, but increased in the Appalachians and upper Piedmont.

Number of Spot Infestations

State	1987	1988
Alabama	2,398	4,164
Arkansas	1,950	1,544
Florida	125	0
Georgia	2,493	8,572
Louisiana	1,925	472
Mississippi	5,706	5,408
North Carolina	2,476	2,127
Oklahoma	8	2
South Carolina	1,317	2,993
Tennessee	2,356	3,969
Texas	819	886
Virginia	1,950	148
Total	23,523	30,285

Texas leafcutting ant *Atta texana*	Southern pines	Louisiana, Texas	Serious losses continued in pine plantations on deep sandy soils.
Virginia pine sawfly *Neodiprion pratti pratti*	Virginia pine, Pitch pine, Shortleaf pine	South Central Kentucky, Virginia	Widespread defoliation was observed, but most trees refoliated.

Southern Region--Status of insects in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia; and Puerto Rico and the Virgin Islands

Insect	Host	Location	Remarks
White pine cone beetle *Conopthorus coniperda*	Eastern white pine	North Carolina, Tennessee, Virginia	Surveys in early January indicated that populations reached five beetles per cone in overwintering sites. Areas protected with controlled burns yielded high numbers of seed. On the Beech Creek Seed Orchard in Nantahala National Forest, beetles killed approximately 10 percent of the cone crop in a burned area compared to nearly 95 percent in an unburned test area. In natural stands, most of the 1989 and 1990 cone crop were killed.
Yellow-poplar weevil *Odontopus calceatus*	Yellow-poplar	Virginia, Tennessee	170,000 acres in Virginia were damaged. Populations in Tennessee were concentrated in upper east Tennessee and the Cumberland plateau.

Southern Region Diseases

Prepared by William Sites and Nolan Hess

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Butternut canker *Sirococcus clavigignenti-juglandacearum*	Butternut	Throughout range of butternut	This disease has gradually eliminated much of the butternut in the Southern Region.
Canker rot *Inonotus hispidus* *Strumella coryneoidea*	Oaks	Alabama, Georgia, Mississippi, North Carolina, Tennessee, Virginia	This common stem problem resulted in degrade and defect of trees and created hazardous tree conditions in recreation and urban areas.
Chestnut blight *Cryphonectria parasitica* (=*Endothia parasitica*)	Native chestnuts, Exotic chestnuts	Throughout host ranges	Large trees have been eliminated. Damage to sprouts continued.
Fusiform rust *Cronartium quercuum* f. sp. *fusiforme*	Loblolly pine, Slash pine	Regionwide, except Kentucky, Puerto Rico, Tennessee, U.S. Virgin Islands	This has continued to be the most serious disease of southern pines. Fusiform rust stem infections occurred on approximately 10 percent of the pines growing on about 15 million acres. Over 600 million trees were stem infected in the Southeast. Annual losses in Florida, Georgia, North Carolina, South Carolina, and Virginia have been estimated at $35 million.
Hypoxylon canker *Hypoxylon atropunctatum*	Hickory, Oak	Regionwide	This pest was common on dead and dying trees weakened by drought or other adverse agents in forest and urban environments. Regional and local droughts in the 1980's resulted in increased incidence of this disease.
Leyland cypress canker *Seiridium cardinale*	Leyland cypress	South Carolina	The canker continued to be a problem in South Carolina seed orchard trees, rooted cuttings, and field plantings. Some trees had dozens of cankers and were killed by the fungus. Trees commonly have shoot dieback and frequently die.

Southern Region--Status of diseases in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia; and Puerto Rico and the Virgin Islands

Disease	Host	Location	Remarks
Pitch canker *Fusarium subglutinans* (=*Fusarium moniliforme* var. *subglutinans*)	Southern pines, especially Loblolly and Slash pines	Florida, North Carolina, Alabama, Arkansas, Louisiana	Widespread damage was reported on slash and shortleaf pine plantations. Severe damage occurred sporadically on loblolly plantations. Damage to urban stands was reported. (See also Seed Orchard diseases)
Slime flux *Erwinia* spp. and other bacteria	Cottonwood, Oak, Other spp.	Regionwide	Slime flux caused severe damage to overmature trees that were previously storm-damaged or pruned.
Stem decay Basidiomycetes	All species, especially Hardwoods	Regionwide	These decay fungi continued to be a serious problem in stands damaged by fires, storms, or logging.
Phellinus pini	Virginia pine, Eastern white pine, Shortleaf pine	Georgia, North Carolina, South Carolina, Tennessee, Virginia	Old-growth sawtimber was affected. Timber sale volume was underestimated due to high incidence and severity in some localities.
Phellinus weirianus	Black walnut	Oklahoma	Heart rot caused major degrade and volume loss.
Stem canker *Fusarium* spp.	Mahoe	Puerto Rico	Understory trees suffered from dieback and cankers.
Twig canker *Sphaeropsis sapinea* (= *Diplodia pinea*)	Spruce pine, Austrian pine, Ponderosa pine	Florida, Oklahoma	Epidemic levels were reported in northwest Oklahoma urban areas and windbreaks.
White pine blister rust *Cronartium ribicola*	Eastern white pine	North Carolina, Virginia	This disease has been found above 3,000 feet and was serious only in localized areas.
Root Diseases			
Annosus root disease *Heterobasidion annosum*	Southern pines, Eastern white pine	Regionwide	Annosus continued to be the most serious root disease in the South. Damage was reported in thinned stands in Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, northeast Texas, and Virginia.
Littleleaf disease *Phytophthora cinnamomi* and *Pythium* spp.	Loblolly pine, Shortleaf pine	Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee	The highest incidence was reported in Georgia, North Carolina, and South Carolina in the Piedmont in natural and planted stands growing on poorly drained, eroded, heavy, clay soils. Low incidence was reported elsewhere throughout the South.

Southern Region--Status of diseases in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia; and Puerto Rico and the Virgin Islands

Disease	Host	Location	Remarks
Root decay *Armillaria* spp. *Inonotus circinatus* *Phaeolus schweinitzii* *Ganoderma lucidum*	Most conifers, Hardwoods	Regionwide	Root decay was common in forest stands and urban areas, especially where stresses were severe, trees overmature, or root systems damaged.
Root decline *Verticicladiella procera*	Eastern white pine, Loblolly pine	Georgia, North Carolina, Tennessee, Virginia	This was a serious problem in Christmas tree plantations. Root decline often has been associated with other root diseases and may be insect vectored.
Foliage Diseases			
Anthracnose *Gnomonia* sp. *Kabatiella* sp. (= *Gloeosporium* sp.) *Apiognomonia* sp. (=*Gnomoni* sp.)	Hardwoods, especially Ash, Dogwood, Maple, Sycamore, Walnut	Regionwide	Anthracnose caused premature defoliation and shoot dieback. Defoliation was modest to heavy, depending on spring rainfall patterns.
Brown spot *Mycosphaerella dearnessii* (=*Scirrhia acicola*)	Longleaf pine, Loblolly pine	Throughout longleaf range	Brown spot was severe in regeneration areas. The disease has been controlled by using prescribed fire and fungicidal root dips or by planting genetically resistant stock.
Dogwood anthracnose *Discula* sp.	Flowering dogwood	Georgia, North Carolina, South Carolina, Tennessee, Virginia	An often fatal disease of flowering dogwood and new to the South, dogwood anthracnose was found in 49 counties on 5,000,000 acres in mountain and Piedmont areas. The disease caused premature defoliation and tree death in much of the affected area.
Needle casts of pine *Lophodermium* spp. *Ploioderma* spp.	Pines	Regionwide	Moderate levels of infection occurred in central Mississippi, but no defoliation was reported. Some twig dieback was reported on genetically improved shortleaf pine test trees in North Carolina.

Southern Region--Status of diseases in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia; and Puerto Rico and the Virgin Islands

Disease	Host	Location	Remarks
Oak leaf blister *Taphrina caerulescens*	Red oaks	Alabama, Arkansas, Louisiana, Mississippi, Oklahoma, Texas	Reports of leaf blister were scattered but not severe. There were fewer reports than in past years.
Pine needle rust *Coleosporium* spp.	Pines, especially Loblolly	Regionwide	Though widespread throughout the South, little damage was reported.
Vascular Wilts and Declines			
Dutch elm disease *Ceratocystis ulmi*	Elms	Throughout host range	This disease was reported in nine northern Louisiana parishes and two northeastern Texas counties. The disease was also reported in scattered counties in Arkansas, Georgia, North Carolina, South Carolina, Tennessee, and Virginia. In central and western Oklahoma, Dutch elm disease killed trees along water courses which seriously limits elms for shelter-belt use.
Mimosa wilt *Fusarium oxysporum* f. sp. *perniciosum*	Mimosa	Throughout host range	Trees were killed trees throughout the host range.
Oak decline/mortality	Oak species, especially the Red oak group	Regionwide	Decline and mortality were widely reported in the 1980's. Mortality was more frequent on or near ridges with shallow, rocky soils. Drought was a major contributing factor. In a recent survey of three Ranger Districts, about 50 percent of the sawtimber-size host type was affected with about 6 to 13 percent of the basal area dead or declining (>1/3 dieback). Management prescriptions were offered in Alabama, North Carolina, and Virginia.
Oak wilt *Ceratocystis fagacearum*	Oaks	Arkansas, Kentucky, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia	Oak wilt was epidemic in central Texas. In 39 counties live and red oaks were infected. Severe losses occurred in rural and urban areas. Suppression efforts by the Texas Forest Service were begun in three counties and the city of Austin in 1988. North Carolina, South Carolina, Tennessee, and Virginia maintained low-level survey efforts.

Disease	Host	Location	Remarks
Spruce-fir decline and mortality	Fraser fir, Red spruce	North Carolina, Tennessee, Virginia	The balsam woolly adelgid has been killing Fraser fir since it was introduced into spruce-fir areas more than 25 years ago. Atmospheric deposition has been suggested as a contributing factor, but this relationship has not been proven.
Nursery Diseases			
Damping-off *Cylindrocladium* spp. *Fusarium* spp. *Phytophthora* spp. *Pythium* spp. *Rhizoctonia* spp.	Many conifers and Hardwoods	Regionwide	Chronic losses occurred typified by reduced and irregular density in the seedbeds. This disease was retarded by pre- and post-plant fungicide drenches. Several thousand seedlings were lost to *Pythium* infestation in Texas. Oklahoma lost several thousand seedlings to *Fusarium* spp.
Fusarium root rot *Fusarium* spp.	Eastern white pine, Virginia pine, Loblolly pine, Slash pine	Regionwide	This continued to be a problem in poorly drained beds. One nursery in Louisiana lost several thousand seedlings.
Fusiform rust *Cronartium quercuum* f. sp. *fusiforme*	Loblolly pine, Longleaf pine, Slash pine	Eastern Texas to eastern Virginia	Excellent control was achieved with applications of systemic fungicides to seed and foliage in nurseries.
Rhizoctonia needle blight *Rhizoctonia* sp.	Longleaf pine	Alabama, Louisiana	This pest caused needle necrosis and bud death in nurseries with deep, sandy soils and inadequate mulch.
Tip blight *Phoma* sp. (in association with Lygus bug feeding)	Loblolly pine	Regionwide	Disease incidence was lower than that reported in past years. This may have been related to mulching and insect control. Scattered mortality and damage were reported in several nurseries in Arkansas and Alabama where 10,000 seedlings were culled. In Alabama, considerable infection incidence resulted in little mortality.
Seed Orchard Diseases			
Cone damage *Lasiodiplodia* sp.	Eastern white pine	North Carolina	Cones in storage were infected and may be weakly pathenogenic.

Disease	Host	Location	Remarks
Pitch canker *Fusarium subglutinans* (= *Fusarium moniliforme* var. *subglutinans*)	Southern pines, especially Slash pine and Loblolly pine	Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Texas	Orchards sustained sporadic damage that sometimes caused severe branch, flower, conelet, and cone mortality, as well as contaminating seed extracted from infected cones. Damage was clonal. Fungicidal controls were explored in South Carolina. The first year results showed a reduction in conelet (1988 flowers) losses but little effect on cone (1987 flowers) losses or seed contamination. Greenhouse screening of slash pine for tree improvement applications has been operational at the Resistance Screening Center.
Root diseases *Armillaria* spp. *Armillaria tabescens* (=*Clitocybe tabescens*) *Heterobasidion annosum* *Inonotus circinatus* *Verticicladiella procera*	Eastern white pine, Shortleaf pine	North Carolina, South Carolina	Low incidence was reported, but symptoms and mortality persisted in seed orchards.
Abiotic			
Ozone	Eastern white pine	North Carolina	Fourteen percent of the stands had trees with ozone symptoms in 13 counties in western North Carolina.
Atmospheric deposition symptoms	Bioindicators, such as Yellow-poplar, Blackberry, Ash, Sweetgum	Georgia, North Carolina, South Carolina, Virginia	About 50 percent of the sensitive species showed some air pollution symptoms, but the damage occurred later in the year and was less severe.
Drought	Mixed hardwoods, Loblolly pine, Slash pine, Eastern white pine, Rhododendron	Arkansas, North Carolina, Virginia	Survival of bare-root trees was reduced relative to container-grown eastern white pine in Virginia progeny test areas. Armillaria root disease combined with drought killed rhododendron thickets in urbanized North Carolina forests.

Southern Region--Status of diseases in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia; and Puerto Rico and the Virgin Islands

Eastern Region / Northeastern Area Insects

Prepared by Barbara A. Levesque and Margaret Miller-Weeks

Insect	Host	Location	Remarks
Aphids *Periphyllus americanus* *Periphyllus lyropictus* *Periphyllus testudinacea*	Sugar maple	Vermont	Aphids were common on sugar maple throughout the Region. Some heavily infested trees suffered no apparent damage while others suffered leaf yellowing or premature leaf drop.
Balsam gall midge *Paradiplosis tumifex*	Balsam fir	Vermont	Moderate to heavy Christmas tree damage was observed, especially in northern areas of the State where occurrence of the midge was widespread.
Balsam shootboring sawfly *Pleroneura brunneicornis*	Balsam fir, Fraser fir	Maine	Heavy populations and damage were reported. This was an increase from 1987.
		Vermont	Moderate to heavy damage occurred in Christmas tree farms.
Balsam twig aphid *Mindarus abietinus*	Balsam fir	Vermont	Light to moderate Christmas tree damage was observed.
Balsam woolly adelgid *Adelges piceae*	Balsam fir	Vermont	Light populations were present after several years of absence.
Basswood thrips *Thrips calcaratus*	Basswood	New York, Wisconsin	Damage was severe in some areas of New York. Wisconsin observed a decrease in basswood thrips populations in the northeast, but northwestern areas saw a population increase. The Department of Natural Resources, University of Wisconsin, and U.S. Department of Agriculture, Forest Service, were evaluating the impact of the defoliation.
Birch casebearer *Coleophora serratella*	White birch	Maine	The northern two-thirds of the State were affected. Scattered spots of defoliation were noticeable with an increase in top dieback and tree mortality in old infestations. Increased degrade was due to heavy defoliation that had occurred previously.

Eastern Region and Northeastern Area--Status of insects in Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

Insect	Host	Location	Remarks
Birch leaf miner *Fenusa pusilla*	Gray birch, Paper birch, Yellow birch	Maine, Vermont, Wisconsin	Populations and damage were heavy and more widespread in Maine. Moderate to heavy defoliation occurred in northern Vermont while southern Vermont saw a decrease in defoliation. Approximately 800 acres were impacted in Wisconsin.
Browntail moth *Euproctis chrysorrhoea*	Cherry, Oaks, Roses, Rubus, Willow	Maine, Massachusetts	Low level infestation with light defoliation occurred on offshore islands. Populations increased slightly creating a possible threat to the mainland. Moderate defoliation occurred. A major concern was dune erosion due to tree mortality.
Bruce spanworm *Operophtera bruceata*	Sugar maple	Vermont	Larval sightings were made and light defoliation occurred. None had been reported in 1987.
Conifer swift moth *Korsheltellus gracilis*	Balsam fir, Red spruce	New Hampshire, New York, Vermont	This insect was found in feeding wounds on the roots of balsam fir and red spruce at high elevations and occurred in northern areas of the States.
Eastern tent caterpillar *Malacosoma americanum*	Apple, Ash, Black cherry, Maple, Oak, Poplar	New England	Populations increased in Massachusetts with over 1 million acres affected. Defoliation was moderate. Northern Vermont observed an increase in populations. Southern Vermont observed lower populations. Defoliation was light to heavy. Populations were low statewide in Rhode Island for the fifth consecutive year.
		Illinois	Populations were high statewide and affected trees were completely defoliated.
		Indiana	The northern quarter of the state observed high population levels. Moderate to heavy defoliation occurred.
		Missouri	Over 3 million acres were affected and heavy defoliation occurred. Populations increased.
Evergreen bagworm *Thyridopteryx ephemeraeformis*	Evergreens, Locust, Maple, White pine	Indiana, Ohio	Defoliation ran light to heavy in Indiana. This insect has been an increasing problem since 1986.

Eastern Region and Northeastern Area--Status of insects in Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

Insect	Host	Location	Remarks
European pine sawfly *Neodiprion sertifer*	Red pine, Pitch pine, Scotch pine, Shortleaf pine	Iowa	Though the intensity of this pest varied, its presence was always felt statewide.
		West Virginia	Severity ran from light to heavy and was a threat to Christmas tree plantations and urban areas.
		Ohio	Several thousand acres were heavily defoliated with growth losses anticipated.
	Scotch Pine	Illinois	Populations in Christmas tree plantations were light to moderate. Control measures taken in 1987 were probably responsible for the decrease in population.
Fall cankerworm *Alsophila pometaria*	Ash, Beech, Cherry, Hickory, Maple, Oak, Yellow birch	Indiana, Maine, Maryland, Massachusetts, New York, Ohio, Rhode Island, Wisconsin	Light to heavy defoliation occurred in Indiana. Fall cankerworm was found with spring canker-worm and linden looper. Light populations were observed in Maine and Rhode Island but no defoliation was reported. Massachusetts, New York, and Ohio observed high populations and heavy defoliation. An increase occurred in Wisconsin. Defoliation decreased signifi-cantly in Maryland. Approximately 3,000 acres were defoliated, down from 36,000 acres in 1984.
Fall hardwood defoliator complex (Hardwood defoliating species)	Beech, Birch, Maple, Various Hardwoods	Maine	Defoliation was more severe in 1988 than in previous years. Populations were high. Predominant species were variable oak leaf caterpillar (*Lochmaeus manteo*), Orange- humped mapleworm (*Symmerista leucitys*), and Birch sawfly (*Arge pectoralis*).
Fall webworm *Hyphantria cunea*	Various Hardwood Species	Indiana, Maine, Missouri, Rhode Island, Vermont	Populations collapsed in Indiana. Light defoliation and webbing were reported. Numbers of webs per tree were low and webs were scattered. Maine observed heavy populations, moderate defoliation, and scattered mortality. Light to moderate defolia-tion occurred over 1.3 million acres in Missouri. Vermont reported light but increasing popula-tions, while Rhode Island observed a light and stable population.

stern Region and Northeastern Area--Status of insects in Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, chigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

Insect	Host	Location	Remarks
Forest tent caterpillar *Malacosoma disstria*	Aspen, Basswood, Maple, Oak, Poplar, White birch	Lake States	High populations in Wisconsin and Michigan resulted in light to heavy defoliation with some mortality expected in drought-affected areas. Some mortality was reported in Minnesota with an increase in population in the northeastern part of the state.
		New England, New York	Populations were low and stable in Massachusetts, New York and southern Vermont. Trap collections in Maine showed an increase in populations but no defoliation was observed. Northern Vermont had an increase in larval numbers with light defoliation.
Gypsy moth *Lymantria dispar*	Oak, Other Hardwoods	Areawide	Vermont and New Hampshire populations continued to build in some areas. Defoliation was detected aerially in Vermont for the first time since 1982, verifying that populations increased. Within affected areas, defoliation was moderate to heavy in New Hampshire and light to moderate in Vermont.
			Massachusetts reported low populations of the insect. Connecticut's gypsy moth population increased. Rhode Island's insect population decreased statewide.
			In the southern part of Maine, populations subsided or remained at endemic levels.
			In New York, Seneca Indian Lands reported a decrease in population over 1,300 infested acres. Populations decreased in Pennsylvania.
			Approximately 44,000 acres were affected in Delaware with a resurgence in northern parts of the State. New infestations were heavy and defoliation was moderate to severe. Mortality loss was approximately 2.9 million board feet with a stumpage loss of about $290,000. Populations were spreading south through the State.
			Populations continued to decline in New Jersey for the fourth consecutive year. Less than 10,000 acres were defoliated statewide. Less defoliation was reported in Maryland.

Eastern Region and Northeastern Area--Status of insects in Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

Insect	Host	Location	Remarks
Gypsy moth (continued)			About 72,000 acres of forest land in West Virginia were defoliated. The amount of mortality has not been determined. The population expanded and will continue to infest additional acreage. Dimilin was sprayed on over 140,000 acres, with foliage protection achieved on 136,000 acres.
			The area of defoliation nearly doubled in Michigan. Mortality was minimal, but was expected to increase.
			Trap catches in Wisconsin increased. The infestation was located in the eastern part of the State.
			In Indiana, moth catches and new locations reporting gypsy moth infestations increased.
			An infestation in an 80-acre area was under observation in Iowa. Egg masses, larvae and moths were observed, but no defoliation. Observers expected to find additional moths. Efforts were under way to eliminate the infestation.
			Moths, larvae, and egg masses were observed throughout Ohio. No noticeable defoliation was reported.
Hemlock looper *Lambdina fiscellaria*	Various Softwoods and Hardwoods	Maine	Though no defoliation was reported, larval sightings were made and moths were abundant in spruce budworm pheromone traps.
Hemlock woolly adelgid *Adelges tsugae*	Hemlock	New England, New York	In Connecticut defoliation continued. Mortality occurred in areas of past defoliation. Excellent population reduction occurred when oil or Malathion was applied. Small infestations occurred in Rhode Island with little damage and no mortality. Branch decline and mortality were observed in New York. There were no known infestations in Maine but, because of the threat of possible infestation, steps were taken to protect the hemlock resource. Maine, New Hampshire and Vermont quarantined entry of possible adelgid carriers such as hemlock logs, seedlings, chips or bark.

Insect	Host	Location	Remarks
Jack pine budworm *Choristoneura pinus pinus*	Jack pine	Lake states	Jack pine mortality occurred after defoliation and subsequent *Ips* spp. attacks in the Upper Peninsula of Michigan. Populations declined. There were small epicenters of defoliation in the Lower Peninsula. Minnesota observed light to moderate defoliation and a dramatic decrease in populations. Heavy defoliation occurred in Wisconsin.
Larch sawfly *Pristiphora erichsonii*	Eastern larch	Maine, New York	Populations increased in some areas of eastern New York. Light to heavy damage was observed. Mortality followed drought and beetle attacks. In Maine, larval sightings were up and defoliation was limited to single trees.
Lecanium scale *Lecanium sp.*	Black locust, Maple, Oak	Vermont	Southern Vermont observed heavy infestations in sugarbushes but the impact was unknown. Populations were heavy on ornamental oaks in northern Vermont, but populations were lighter in other locations.
Maple trumpet skeletonizer *Epinotia aceriella*	Sugar maple	New York, Vermont	Populations increased in both states and caused light defoliation, potentially threatening sugarbush growers in New York.
Nantucket pine tip moth *Rhyacionia frustrana*	Pines	Missouri	Native to Missouri, this insect has an apparent ten year cycle. Populations in 1988 were moderate to heavy, but if the trend of the past couple of decades continues, a collapse is expected in 1989.
Oak leaftier *Croesia semipurpurana*	Oak	Massachusetts, New Hampshire, Vermont	Moderate to heavy defoliation occurred on over 1 million acres in Massachusetts with populations spreading slowly from west to east. Populations in New Hampshire were fluctuating. Pheromone trap catches increased, but no defoliation was observed in an aerial survey.
Orange-striped Oakworm *Anisota senatoria*	Various Oaks	Rhode Island	Approximately 11,000 acres were affected with low level defoliation. The infested area decreased in size after four years of expanding.

Eastern Region and Northeastern Area--Status of insects in Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

Insect	Host	Location	Remarks
Oystershell scale *Lepidosaphes ulmi*	Beech, Maple, Poplar	Indiana, New York, Vermont	The pest caused dieback and twig mortality in all locations. Populations were light in Indiana and Vermont but increased in New York. Defoliation was severe and covered approximately 470,000 acres. Dry weather increased symptom severity. Red maple, black cherry, white ash, yellow birch and American beech were affected along with sugar maple. Twig and branch mortality was evident. The fungus, *Steganosporium sp.*, commonly was associated with the mortality.
Pales weevil *Hylobius pales*	Red Pine	New York	Pales weevil affected seedlings in central New York. Damage approached $5,000 based on site preparation and replanting costs.
Pear thrips *Taeniothrips inconsequens*	Sugar maple	New England, New York, Pennsylvania	Massachusetts and Vermont were hardest hit in New England. Defoliation ranged from light to heavy. Approximately 2 million acres were affected in Massachusetts and population levels appeared to increase and move west to east. Populations in Vermont also increased. In New York the pest was first found in 1985. Populations rose in 1988 after subsiding in 1986 and 1987. Though population density increased, damage was only spotty. Rhode Island had reports of pear thrips but no actual confirmation. Pear thrips damage was observed in northwestern Connecticut but presence of the insect was unconfirmed. Maine observed scattered thrips in maple buds but found no damage. In New Hampshire, populations were concentrated in the western and southwestern portions of the state and spotty elsewhere. No obvious damage was reported. Pennsylvania, where thrips damage was first observed in 1979, reported a population increase, especially in northern areas of the State. About 1.3 million acres were affected and thrips defoliation contributed to sugar maple decline.

Insect	Host	Location	Remarks
Pine false webworm *Acantholyda erythrocephala*	Various Pines	New York	This insect has been a severe, persistent problem for the past several years. Many host trees died. Defoliation was moderate to severe and spread eastward and southward.
Pine needleminer *Exoteleia pinifoliella*	Pitch pine	New York	The level of defoliation was the highest on record. Major discoloration occurred followed by significant defoliation.
Red pine adelgid *Pineus borneri*	Red pine	Connecticut, Massachusetts	Populations in Massachusetts continued to be low with light defoliation. Conditions have not changed over the last three years. Connecticut continued to see high adelgid populations and mortality occurred statewide.
Red pine scale *Matsucoccus resinosae*	Red pine	New York	In southeastern New York, damage was heavy. Mortality occurred in previously infested areas. The range has increased.
Saddled prominent *Heterocampa guttivitta*	Sugar maple	Maine, Vermont	No defoliation was observed in Maine. Populations remained at 1987 levels. Vermont populations increased with light defoliation observed.
Scolytid beetle *Pityophthorus sp.*	White pine	New York	1988 was the first year of noticeable damage. Twig tips were infested in a 5,000-acre area. No estimates of mortality were available.
Spearmarked black moth *Rheumaptera hastata*	Birch	Maine	Defoliation was very heavy and noticeable in the north-central part of the State. This was the first time this insect has been observed in such abundance in Maine.
Spruce beetle *Dendroctonus rufipennis*	Black spruce, Red spruce, White spruce	Maine, New York	Spruce beetles were observed in budworm-damaged stands in Maine. Approximately 75 percent of the trees in infested areas were killed. Size and severity of the infestation increased, and new areas were identified in aerial surveys. Infestations in New York continued to run from light to heavy and mortality occurred in some areas.

Eastern Region and Northeastern Area--Status of insects in Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

Insect	Host	Location	Remarks
Spruce budworm *Choristoneura fumiferana*	Balsam fir, White spruce	Maine, Michigan, Minnesota, New Hampshire, Vermont	Pheromone trapping in New Hampshire and Vermont showed continued low, stable populations. Michigan observed low populations. Approximately 200,000 acres in northeastern Minnesota were affected by budworm, but this was a 60 percent overall decrease. Insect populations in Maine remained at low levels. Total defoliation occurred on an estimated 65,000 acres. Mortality occurred but mostly due to secondary factors.
Two-lined chestnut borer *Agrilus bilineatus*	Oaks	Minnesota, Wisconsin	Approximately 1.5 million acres were affected in Minnesota. A large increase in populations occurred in Wisconsin with scattered mortality statewide.
Virginia pine sawfly *Neodiprion pratti pratti*	Shortleaf pine, White pine	Ohio, Virginia	This sawfly has been a problem for the past two years. Moderate to severe defoliation was observed, and mortality occurred in some areas.
Walnut caterpillar *Datana integerrima*	Walnut	Illinois	The northern two-thirds of Illinois were affected. Defoliation was moderate to heavy.
White pine weevil *Pissodes strobi*	Jack Pine, Scotch pine, White pine, Blue spruce, Norway spruce, Red spruce, White spruce	Maine, Michigan, New York, Rhode Island, Vermont	The white pine weevil was a major pest of Jack Pine in Michigan. Over 3,000 acres were affected. Weevil damage was present on approximately 25 percent of plantation white pine in Maine. Volume loss was significant but more important was the loss in grade due to stem deformation. Incidence was high the past few years. Populations ranged from low to moderate in New York, Rhode Island, and Vermont.
Yellowheaded spruce sawfly *Pikonema alaskensis*	Spruce	Lake states	1988 was the third year of significant defoliation in the Upper Peninsula of Michigan. In Minnesota, infestations were heaviest along roadside trees. Plantations have not been affected.
		Vermont	This pest was not observed in 1988.

Eastern Region and Northeastern Area--Status of insects in Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

Insect	Host	Location	Remarks
Yellownecked caterpillar *Datana ministra*	Oak	Illinois	Severe defoliation occurred throughout central Illinois.
Yellow-poplar weevil *Odontopus calceatus*	Elm, Tuliptree, Sassafras, Yellow poplar	Indiana, Ohio	Light to moderate defoliation occurred in Indiana. This was the second year of infestation. Several thousand acres were affected. Heavy browning of tips and some defoliation occurred.

Eastern Region and Northeastern Area--Status of insects in Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

Eastern Region / Northeastern Area Diseases

Prepared by Barbara A. Levesque and Margaret Miller-Weeks

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Beech bark disease *Nectria coccinea* var. *faginata* and *Cryptococcus fagisuga* Beech scale	American beech	Connecticut, Massachusetts, New Hampshire, New York, Rhode Island, Vermont	Mortality and dieback continued throughout New England. The disease increased in intensity in western New York, and levels remained low in eastern New York. Mortality was high in the Adirondacks and Catskills. The disease was observed in southern Vermont, but at levels lower than in 1987. Northern Vermont observed an increase in the disease. Beech scale levels increased in all areas of the state.
		Pennsylvania, West Virginia	Beech bark disease increased along with beech scale populations. Light to moderate mortality was observed affecting approximately 466,000,000 board feet in the two states including the Monongahela National Forest.
Caliciopsis canker *Caliciopsis pinea*	White pine	Vermont	This disease was present in northern Vermont. New infections occurred in 1988. The crowns of the trees appeared unhealthy, but no mortality was observed. A heavy resin flow that resembles white pine blister rust has been observed on infected trees.
Cytospora canker *Valsa kunzei* (*Cytospora kunzei*)	Blue Spruce, Norway Spruce, Red spruce	West Virginia	This disease occurred throughout the state and was most common on Norway spruce. It has become more common on native red spruce stands.

Eastern Region and Northeastern Area--Status of diseases in Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

Disease	Host	Location	Remarks
Diplodia tip blight *Sphaeropsis sapinea*	Austrian pine, Red pine, Scotch pine	Indiana, Iowa, Massachusetts, Minnesota, Rhode Island, New York, Vermont, West Virginia, Wisconsin	Light damage occurred in Indiana. Rhode Island and Vermont observed spotty diplodia tip blight occurrence in 1988. All other areas reported an increase in incidence with light to heavy infections. Diplodia tip blight was a major problem on host species. Pine mortality was common in southeastern New York. Wisconsin observed a high incidence in 1988.
Dogwood anthracnose *Discula sp.*	Dogwood	Maryland, New York, Massachusetts, Connecticutt, New Jersey, Pennsylvania, Delaware, West Virginia	Since 1984, mortality increased approximately 80 percent in Maryland. Fungicide applications to control leaf infections were successful on high-value landscape trees. Anthracnose increased in southeastern New York.
European larch canker *Lachnellula willkommii*	Eastern larch	Maine	Infection was confined to the coastal regions of the state. Infection was heavy at two epicenters. Incidence elsewhere was light to moderate. Mortality occurred on sapling-pole-sized trees. State and Federal quarantines were in effect and were enforced. The disease did not spread to new townships, so quarantine boundaries remained the same as 1987.
Hypoxylon canker *Hypoxylon atropunctatum*	Oaks	West Virginia	Incidence increased. This may have been due to an increase in dead and dying timber brought on by drought and defoliation.
Scleroderris canker *Ascocalyx abietina* (=*Gremmeniella abietina*)	Red pine, Scotch pine, Jack pine	Maine, New York, Vermont	Scattered infections were observed in Maine, but no mortality was reported. New infections and mortality decreased statewide in New York and Vermont.
		Upper Peninsula of Michigan	Scattered pockets of branch flagging were observed, but no new infections or tree mortality occurred.

Disease	Host	Location	Remarks
Stegansporium *Steganosporium spp.*	Sugar maple	Vermont	This disease was abundant in association with current branch and twig dieback. Trees predisposed by pear thrips damage could be subject to attacks by this opportunistic fungus.
White pine blister rust *Cronartium ribicola*	White pine	Iowa, Maine, Vermont	Blister rust was a problem only in the northeastern part of Iowa. There was a significant increase in severity in 1988 compared to previous years. In Maine, the disease occurred statewide. Annual losses have run between $60,000 and $100,000. Vermont observed few new infections with no change in mortality rates from 1987 to 1988.
Foliage Diseases			
Anthracnose *Gloeosporium spp.*	Maple, Sycamore, Other Hardwoods	Missouri, Indiana, West Virginia, Pennsylvania, Vermont, Connecticut	Indiana defoliation was moderate to heavy statewide. Unusual crown symptoms were exhibited. Lower crowns developed normally and crown tops suffered dieback. A prolonged period of cool, wet weather during bud break caused an increase in anthracnose incidence in Pennsylvania. Moderate to severe defoliation was reported. Sycamore anthracnose was severe in Missouri. Trees exhibited up to 75 percent defoliation. The disease was reported in western Connecticut. Vermont observed traces of anthracnose on sugar maple at high elevations but incidence was down from 1987. Levels of incidence were moderate to severe in West Virginia. Hardwoods along river drainages sustained the most damage.

Disease	Host	Location	Remarks
Vascular Wilts and Declines			
Ash yellows (Ash dieback)	Green ash, White ash	New York, Vermont	Ash yellows, caused by a mycoplasma-like organism, was observed in New York and Vermont with associated ash dieback. Dieback was responsible for tree mortality in New York.
		Indiana	The northern one-third of the state exhibited ash dieback symptoms and 50 percent had ash yellows.
		Iowa	Ash yellows continued to increase in Iowa. Damage ranged from light to heavy in saw-timber-sized trees. Because trees seem to have maintained soundness several years after death, salvage operations continued.
		Minnesota	This was the first report of ash yellows in Minnesota. Advanced stages of dieback and mortality were observed.
		Missouri	For the first time in 1988 ash yellows was detected in Missouri. Extensive dieback symptoms were observed in affected trees, but no mortality was reported. Only white ash was affected.
		Ohio, Pennsylvania	Decline of ash continued, and scattered dieback and mortality occurred.
Birch dieback	White birch	Maine, Vermont	White birch in the western portion of Maine were affected. Scattered defoliation occurred. Whole crown dieback appeared to stabilize. The 1988 drought contributed to increased twig dieback. Dieback was observed increasingly in the southern part of Vermont and at higher elevations. Ambrosia beetles were found in association with declining birch.

Disease	Host	Location	Remarks
Dutch elm disease *Ceratocystis ulmi*	American elm	Region-wide	Elm disease was evident in Indiana. Mortality was observed. Dutch elm disease caused mortality throughout Ohio. An aggressive strain of the fungus has become more abundant in Vermont. Increased mortality was reported. Drought may have contributed to the severity of infection. Incidence was high throughout West Virginia. This disease was considered to be the single most important forest and shade tree problem in the state.
Larch decline	Larch	Maine, New York, Vermont	Larch decline incidence, associated with the eastern larch beetle, continued in Maine. There were new reports of eastern larch beetle and mortality. Some salvage was conducted. Larch decline increased in New York after low incidence for the past two years. The eastern larch beetle contributed to moderate mortality. Decline increased in Vermont. Drought and the beetle influenced the situation.
Oak decline	Red oak	Missouri, New York, Upper Peninsula of Michigan, West Virginia	Approximately 125,000 acres were affected in Missouri. There was an accumulated loss of $60 an acre for 15 years. Drought, Armillaria root rot, and the two-lined chestnut borer contributed to severe decline. Similar stress conditions prevailed in the Upper Peninsula. Oak decline followed heavy gypsy moth defoliation in New York in the early 1980's. In West Virginia, drought and insect defoliation contributed to pockets of mortality.

Eastern Region and Northeastern Area--Status of diseases in Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

Disease	Host	Location	Remarks
Oak wilt *Ceratocystis*	Oak	Indiana	This disease has been an annual problem throughout Indiana. Mortality occurred.
		Iowa	The disease showed a significant increase from 1987. Increased incidence may be due to drought effects. Severity of the disease ranged from light to heavy.
		Lake States	Approximately 2 million acres were affected in Minnesota with an increase in the Minneapolis and St. Paul metro region. Numbers of epicenters increased slightly throughout northern Michigan. Oak wilt was still present in Wisconsin, but no new areas of infection were located. Drought was a factor in the increase.
		West Virginia	The disease was still present in the state, but at low levels.
Pine wood nematode *Bursaphelenchus xylophilus*	Austria pine, Jack pine, Japanese pine, Scotch pine, Black pine, White pine	Maine, Missouri, New York, West Virginia	Pinewood nematode was found and confirmed on balsam fir at two locations. Previously, the disease was reported on pine only. Economic losses of up to $10,000 occurred in Missouri. Pinewood nematode was epidemic on Scotch pine. There was an increase in mortality in southeastern New York. The State tree nursery discontinued shipment of Japanese black pine because of the black pine's inability to survive. The disease was detected on a West Virginia Christmas tree plantation for the first time. Trees stressed by drought were most susceptible.
Spruce-fir decline	Balsam fir, Red spruce	Maine, Massachusetts, New Hampshire, New York, Vermont, West Virginia	Red spruce and Balsam fir continued to show decline and mortality. No new significant areas of decline were observed. Factors that contributed to the decline included biotic factors, such as spruce beetle, eastern dwarf mistletoe, weather related factors, and other undetermined factors, such as the possible role of air pollution.

Disease	Host	Location	Remarks
Sugar maple decline	Sugar maple	Maine, New York, Vermont	In Maine, no known areas of unexplained dieback or mortality have been observed. Site related and insect-caused problems have been noted. Approximately 125,000 acres were affected in New York. Mortality increased within declining areas. Effects of drought were not yet determined. Branch dieback was widespread throughout the state of Vermont. Dieback occurred mostly in lower crowns. Factors that contributed to the problem were drought and *Steganosporium*, an opportunistic fungus.
Sapstreak *Ceratocystis coerulescens*	Sugar maple	Vermont	Sapstreak was present again in northern Vermont, especially in sugarbushes and maple stands.
Abiotic			
Ozone	Conifers, Hardwoods	New Hampshire, Rhode Island, Vermont	Ozone levels were high in New England during the summer of 1988. Vermont measured the highest levels ever recorded in that state. Symptoms of light to moderate damage occurred on black cherry, white ash, white pine and several shrubs. Rhode Island observed pockets of needle spotting. As part of a Federal Program, monitoring has begun in wilderness areas on the Green Mountain and White Mountain National Forests.
Drought	Conifers Hardwoods	Area-wide	The drought of 1988 was the one weather factor that impacted the entire area. Drought damage was reported from tree nurseries to mature timber stands. Trees have now been predisposed to insect and disease attack for the next 2 to 3 years.
Other			
Stillwell's syndrome	Balsam fir	Maine	Balsam fir mortality was associated with Armillaria root rot in areas of prior spruce budworm defoliation. There has been an increase in occurrence since 1987, but not as severe as the 1984-86 levels.

Alaska Region Insects

Prepared by Edward H. Holsten and Andris Eglitis

Insect	Host	Location	Remarks
Cottonwood defoliator *Chrysomela* sp. *Lyonetia* sp.	Black cottonwood	Prince William Sound and Southeast Alaska	Leaf beetle and blotch-miner populations increased in the Sound. About 11,000 acres were defoliated near Valdez and Kings Bay. In southeast Alaska, the leaf beetle defoliated 4000 acres of cottonwood and willow near Haines, and damaged 800 acres of cottonwood along the Whiting River near Juneau. Homeowners near Juneau also reported leaf beetle damage to urban cottonwoods.
Engraver beetle *Ips perturbatus*	White spruce	Interior Alaska	*Ips* populations decreased near Fairbanks. Infestations were scattered over 1,500 acres with pockets of heavy mortality on 1,000 acres.
Gypsy moth *Lymantria dispar*	Hardwoods	South-central Alaska	Ground checks and pheromone trapping did not detect the presence of gypsy moths. One moth was trapped in 1987 near Anchorage.
Hemlock sawfly *Neodiprion tsugae*	Western hemlock	Southeast Alaska	Sawfly populations declined and no visible defoliation was detected. Previously undetected top-kill and mortality of western hemlock were mapped on 3000 acres, mostly in the southern portion of the Tongass National Forest.
Large aspen tortrix *Choristoneura conflictana*	Quaking aspen	Interior Alaska	Tortrix populations decreased throughout interior Alaska. Aerial surveys detected approximately 118,000 acres of defoliated aspen compared to over 166,000 acres in 1987.
Spear-marked black moth *Rheumaptera hastata*	Paper birch	Interior Alaska	Black-moth populations declined. Only 234 acres of defoliated birch were detected compared to over 25,700 acres in 1987.

Insect	Host	Location	Remarks
Spruce beetle *Dendroctonus rufipennis*	Lutz spruce, Sitka spruce, White spruce	Alaska	Infestations covered over 387,000 acres, which was 100,000 more acres than in 1987. Infestations continued on over 36,000 acres of the Chugach National Forest and on 80,000 acres of the Kenai National Wildlife Refuge. Spruce beetle populations were low and fairly stable in southeast Alaska. In Yakutat, about 2000 acres of Sitka spruce were infested near old windthrow salvage units. In Glacier Bay National Park, the area of infestation totaled nearly 15,000 acres. More than 140,000 acres of white spruce were infested along the Yukon River south of Galena, double the acreage infested in 1987.
Spruce bud midge *Dasineura swainei*	Black spruce, White spruce	South-central Alaska	Bud midge damage was prevalent on open grown regeneration throughout the Kenai Peninsula. In many cases, multiple leaders resulted.
Spruce budworm *Choristoneura* sp.	Sitka spruce, White spruce	South-central and southeast Alaska	Defoliation was not apparent in Alaska's spruce stands.
Spruce aphid *Elatobium abietinum*	Sitka spruce	Southeast Alaska	Due to a mild winter, aphid populations rose. Damage to Sitka spruce was noted around several communities including Juneau, Sitka, Petersburg, Craig and Klawock (Prince of Wales Island).
Tent caterpillar *Malacosoma* sp.	Mountain ash, Red Cherry	South-central Alaska	A species of tent caterpillar, probably the western tent caterpillar, was recently introduced into Anchorage. Infested ornamentals were treated. This was the first record of tent caterpillar in Alaska.
Western black-headed budworm *Acleris gloverana*	Western hemlock, Sitka spruce	Prince William Sound and southeast Alaska	Budworm populations dramatically increased in Prince William Sound. 145,000 acres of heavily defoliated hemlock and spruce were detected aerially. This outbreak was surprising with respect to its intensity and magnitude as no budworm defoliation was detected in 1987. In southeast Alaska, budworm populations remained at low levels.

Insect	Host	Location	Remarks
Willow defoliation Tortricidae	Willow	Interior Alaska	Defoliation of willow was detected along the Nushagak and Yukon Rivers. Acres infested decreased to slightly more than 4,300 from 18,000 in 1987. The causal agent has yet to be identified.
Willow leafblotch miner *Lithocolletis* sp.	Willow	Southeast Alaska	For the second consecutive year, willow discoloration was noted along the highway north of Juneau.

Alaska Region Diseases

Prepared by Paul E. Hennon

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Hemlock dwarf mistletoe *Arceuthobium tsugense*	Western hemlock	Southeast Alaska	This continued to be the most destructive disease of old-growth western hemlock throughout southeast Alaska. This disease caused growth loss, stem deformity, and mortality in old-growth stands. Research and control efforts focused on young stands.
Spruce broom rust *Chrysomyxa arctostaphyli*	White spruce, Sitka spruce, Black spruce, Lutz spruce, Spruce	Interior and south-central Alaska	Spruce broom rust was common where spruce grew near the alternate host, kinnikinnik (*Arctostaphylus uva-ursii*). This disease has caused an undetermined amount of growth loss in Alaska.
Stem cankers *Encoelia pruinosa* *Ceratocystis fimbriata* *Cryptosphaeria populina* *Cytospora chrysosperma*	Hardwoods	South-central and interior Alaska	Canker fungi caused tree mortality. Exposed wood in cankers, allowed decay fungi to enter trees. This was particularly common in aspen, birch and poplars.
Stem decays Many Basidiomycetes	All tree species	Throughout Alaska	Wood decay of live trees caused a large, but undetermined loss of wood volume throughout Alaska in unmanaged old-growth stands.
Western gall rust *Endocronatium harknessii*	Shore pine	Southeast Alaska	This disease was common throughout the range of pine in Alaska. Rust galls were often killed by another infection, *Nectria macrospora*, which hastened branch or bole death.
Root Diseases			
Armillaria root rot *Armillaria* spp.	All tree species	Throughout Alaska	This disease was seldom the primary reason for mortality. In Alaska, Armillaria root rot was most often a secondary invader of stressed trees.

Disease	Host	Location	Remarks
Schweinitzii butt rot *Phaeolus schweinitzii*	Sitka spruce, White spruce, Lutz spruce	Southeast and south-central Alaska	Decay in roots and butts of large trees caused loss of wood volume and created hazardous trees in recreation areas.
Tomentosus root rot *Inonotus tomentosus*	White spruce, Lutz spruce	South-central and interior Alaska	This disease caused significant butt rot in spruce. Tomentosus root rot colonized live roots and predisposed spruce to bark beetle attack.
Foliage Diseases			
Shoot blight *Aprostrasseria* sp.	Alaska-yellow cedar	Southeast Alaska	Shoot blight killed terminal and lateral shoots back about 10 cm on regenerating seedlings and saplings.
Spruce needle cast *Lirula macrospora*	Sitka spruce	Southeast Alaska	Incidence was greater than for any recent year. This disease has been common on forest and urban trees. Spruce needle cast has not caused mortality, and the impact on growth rates of infected trees was not known.
Spruce needle rust *Chrysomyxa ledicola*	Sitka spruce, White spruce, Black spruce, Lutz spruce	Throughout Alaska	Incidence and infection levels were lower than for previous years.
Vascular Wilts and Declines			
Alaska-cedar decline	Alaska-cedar	Southeast Alaska	Decline persisted as one of the most important problems in Alaska. Over 340,000 acres of unmanaged stands had dying, recently-killed, and long-dead trees. Concentrated current mortality occurred on Kuiu and Chichagof Islands. Two abiotic hypotheses (freezing damage to fine roots and soil toxicity) have been proposed as factors that initiate decline.
Other			
Brown bear *Ursus arctos*	Alaska-cedar	Southeast Alaska	Basal wounds have been caused by brown bears every spring. Internal wood decay occured in cedar trees with old scars. Over 50 percent of cedar trees were scarred in many stands on Baranof and Chichagof Islands.

Disease	Host	Location	Remarks
Hemlock fluting	Western hemlock	Southeast Alaska	Fluted hemlock trees had deeply incised grooves and ridges extending vertically on their boles. Fluting resulted in bark that had been buried internally in wood which resulted in loss of quality and quantity of wood.
Porcupine *Erethizon dorsatum*	Sitka spruce, Western hemlock	Southeast Alaska	Porcupines caused considerable bole damage and mortality in commercially important young-growth stands. Basal scarring also occurred in older trees.

Part 3 Index

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The common and scientific names of the insects come from "Common Names of Insects and Related Organisms," published in 1982 by the Entomological Society of America, and two U.S. Department of Agriculture publications: "Western Forest Insects" (Miscellaneous Publication 1339; 1977) and "Insects of Eastern Forests (Miscellaneous Publication 1426; 1985).

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The common and scientific names of the disease-causing organisms are based on the compendium entitled "Common Names for Tree Diseases in the Western United States and Western Canada" by Hawksworth, Gilbertson, and Wallis (a 1985 supplement to the proceedings of the 32nd annual Western International Forest Disease Work Conference) and "Diseases of Forest and Shade Trees of the United States" by George Hepting (Agriculture Handbook 386; 1971). Based on continuing taxonomic research, many scientific names have been changed.

The Center for Forest Mycology Research at the Forest Service's Forest Products Laboratory in Madison, WI, is the information source for name changes.

Synonyms of recently changed names are in parentheses in the disease sections in Part II; anamorphs are shown in brackets. This differentiation is not made in the index.

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